JOURNAL

OF

The Philadelphia College of Pharmacy.

NEW SERIES.

VOL. II.—JULY 1830.—NO. II.

Original Communications.

Das Brom und seine Chemishe Verhältnisse. Von Carl Löwig.

Bromine and its Chemical Combinations. By Charles Lowig. Heidelberg, 1829. *Translated and abridged by Elias Durand.*

Mr Charles Löwig, professor of chemistry in the university of Heidelberg, and formerly a manufacturing chemist in Kreuznach, published last year, under the above title, a very interesting monograph of bromine, which we have read with the greatest satisfaction. From the abilities of the author, his indefatigable perseverance in chemical pursuits, and from the excellent opportunity he had of fully investigating the properties of this substance, which is contained in a comparatively large quantity in the bittern of the salt-works of Kreuznach, we expected much information, and indeed we have not been disappointed. His monograph of bromine is undoubtedly the

most complete that has yet appeared, and he has not only given the results of his own experiments, but has also availed himself of all that had been already published on the same subject by Messrs Balard, Serullas, Desfosses, Liebig, De la Riva, Hermann, Vogel, &c.

As a medical agent, bromine is not yet entitled to much consideration. However, it seems to possess a great analogy with iodine; and has been exhibited successfully by Dr Barthey, Pourelle and others, both externally and internally, in cases of brouchocele, scrofula and syphilis, either edulcorated with forty parts of distilled water, and administered in doses of from five to eight drops, or in the state of hydrobromate of potassa, bromide of mercury, &c.; but more experiments are wanting before it may be ranked amongst the articles of the Materia Medica. It is only as a *new simple body* that our author has treated his subject; and we hope that the singular properties of this substance, its great analogy with chlorine and iodine, to both of which it is intermediate, and its first discovery in sea water, a fluid so often before submitted to chemical analysis without any manifestation of its presence, will render the following abstract of Mr Löwig's work highly interesting and new to a great number of our readers.

Bromine, in exterior appearance, resembles so much the chloride of iodine, that both these fluids have been considered by many chemists as perfectly identical; but the ingenious experiments of Messrs De la Rive and Vogel have proved in a satisfactory manner that bromine was really a simple body.

Mr De la Rive filled a small glass cup with bromine and introduced into it the two platinum wires of a galvanic pile. On approaching the extremities of both wires, the galvanometer gave no indication whatever of the smallest variation, as generally happens when distilled water is acted on in the same way. He afterwards filled a similar small cup with a mixture of distilled water and a small quantity of bromine, and submitted it to the influence of the voltaic battery; a copious evolution of gas took place at the extremity of both wires, which gas proved, on careful examination, to be oxygen at the positive pole, and hydrogen, in the proportion of two to one of

oxygen, at the negative pole. Thus nothing but water was decomposed.

Starch, which is the best test for iodine, which colours it blue, is also the test for bromine, a few drops of which communicate to it a beautiful orange colour. When bromine is added to a solution of starch, already turned blue by iodine, a combination is obtained producing two distinct colours, one brownish and the other yellowish. If this combination of bromine and iodine, found in the solution of starch, is submitted to the action of galvanism, a handsome blue colour, indicating the presence of iodine, is instantly perceived at the negative pole, whilst an orange colour is produced at the positive pole, where bromine seems to be attracted. By this experiment the smallest quantity of bromine and iodine existing in a solution of starch may always be easily detected.

Vogel found that when dry chlorine and iodine came in contact, they were converted into a dark orange fluid, which, for odour, colour and solubility in water, alcohol and ether, was scarcely distinguishable from bromine; but the following difference was found to exist between these two substances: Sulphurous and hydrosulphuric acids acted upon the chloride of iodine by instantly changing it to a deep brown colour and precipitating iodine; whilst, on the contrary, these same acids bleached completely the bromine and transformed it into a liquid as limpid as water. The alkaline solutions, those of ammonia and baryta, precipitated a considerable quantity of iodine from its combination with chlorine, whereas they only deprived bromine of its colour.

From these experiments it is evident that if bromine were a compound containing iodine, the latter, when a solution of bromine and starch is acted upon by electricity, would accumulate at one of the poles and produce a blue colour; but De la Rive, by submitting this solution for a length of time to the action of the pile, ascertained that no change of colour was produced at either of the poles, and that nothing but water was decomposed. The same result is obtained when a solution of iodine and starch is exposed to the same influence, whereas with a solution of chlorine no evolution of hydrogen takes place, because chlorine, possessing a greater power of affinity with the

bases than iodine and bromine, combines instantly with hydrogen to form hydrochloric acid, which remains in solution.

On the other hand, if bromine were a combination of chlorine and iodine, it would form with the alkaline solutions both an alkaline iodate and a hydrochlorate; but experiment proves to the contrary, for if the salt of the oxacid, which is immediately precipitated when bromine is added to a concentrated alkaline solution, be heated and afterwards treated with manganese and sulphuric acid, it will be found that the very same substance is obtained, which is also produced when the salt of the hydracid, which remains in solution, is evaporated to dryness and treated in the same way. These few experiments seem to prove clearly that bromine is a simple body.

Bromine was discovered in 1826 by Balard, a young pharmaceutist of Montpellier in France, who was led to this discovery by observing that when the lie of the ashes of warm plants containing iodine was treated by a mixture of chlorine and starch, not only a blue colour was produced, but also a zone of an orange colour appeared just above it. Balard called it at first *muride;* but this name was soon after changed into that of *bromine*, from Βρωμος, a strong smell.

Balard's discovery was scarcely known before researches were made, in order to discover bromine wherever it was supposed likely to be found. Liebig was the first who obtained it from the salt-works of Kreuznach; Balard found it in the state of hydrobromates of magnesia and soda in sea water, in marine plants, and several marine animals; and finally, its existence was ascertained by other chemists in the waters of the Dead and other seas, in salt-mines, in several mineral springs, in sponges in the state of hydrobromate of lime, in the ores of zinc of Silesia, and generally in almost all the salt-works, but in such a small quantity that it is impossible to obtain it on a large scale. The salt-works of Kreuznach seem as yet to be the most productive; from thirty pounds of the bittern, Liebig obtained three drachms and a half of bromine and one grain of iodine*.

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* In order to ascertain whether a mineral spring contains any bromine, evaporate the water and crystallize the greatest part of the salt; then sepa-

The extraction of bromine from the various mother-waters of the salt-works is founded upon the greater affinity which chlorine possesses for the bases with which bromine is combined. Thus, it is obtained either by evolving chlorine from a mixture of common salt, manganese and sulphuric acid, and transmitting it into the bittern; or by liberating chlorine in the bittern itself, by means of sulphuric acid and manganese, when the liquor contains any other hydrochlorates but that of lime; or by manganese and hydrochloric acid. Mr Löwig gives an account of the different processes employed by Balard, Desfosses and Hermann in the production of bromine; but we shall, here, mention only the method which he has found most advantageous to obtain that substance from the bittern of the salt-works of Kreuznach.

The bittern is evaporated to one-third its volume in large iron kettles and left to crystallize. The mother-water is then separated, diluted with water, and sulphuric acid added to it as long as it forms a precipitate. The liquid is now decanted, the precipitate strained, and the whole evaporated to dryness. The dry mass is mixed with an equal weight of water, by

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rate the mother-water by means of the filter, and put it into a narrow glass tube. On dropping a few drops of concentrated liquid chlorine, the orange colour is immediately produced, and increases in intensity as a larger proportion of chlorine is added. When the mother-water has acquired a certain degree of colour, this colour vanishes gradually, and finally disappears completely.

It is necessary to be very cautious as to the quantity of chlorine which is employed, as an excess of it would prevent the whole reaction from taking place; the mother-water should also be free of any organic matter.

If iodine exists at the same time in the same fluid, the only modification of the process to be resorted to consists in mixing starch with the mother-water, and to continue the addition of liquid chlorine as long as the blue colour is perceptible. With this due caution, there will be a moment at which the fluid loses all its colour, and by the addition of a few more drops of chlorine, the yellow colour will instantly be produced by the reaction of bromine. By ascertaining the quantity of solution of chlorine required to let free the bromine from a determinate quantity of mother-water, it will be easy to determine in what proportion bromine is contained in the water.

which a great quantity of sulphate of lime is separated; and is then distilled, with manganese and hydrochloric acid, in a retort furnished with a long neck, which plunges under the surface of a small quantity of water contained in a receiver surrounded with a freezing mixture. On applying heat, a disengagement of red vapours of bromine is produced, which condense mostly in the neck of the retort. The portion of bromine which passes in the state of vapours is dissolved by the water, and that which condenses into drops in the neck of the retort runs down to the bottom of the vessel by its own specific gravity, which is considerable. The water soon becomes saturated with bromine, and no other portion is lost except that which may volatilize in the atmosphere. In order to obtain it pure and anhydrous, it must be distilled again over some chloride of lime.

Bromine viewed in mass and by reflected light is a fluid of a dark blackish colour; but when a thin stratum is interposed between the light and the observer, it appears of a hyacinth red. Its smell is very strong, disagreeable and penetrating; its taste powerful, astringent, burning and repulsive; it acts with energy on organic matter, and stains the skin of a yellow colour, rather lighter, however, than that produced by iodine; this stain soon passes to brown and disappears, after destroying the epidermis only, and generating a violent itching and burning.

According to Balard, the specific gravity of bromine is 2.966; Löwig, by weighing a large quantity of it, at 60° Fahr. found it to be 2.98 to 2.99. It does not redden litmus paper, but bleaches it entirely, almost as readily as chlorine. It congeals between 0° and —2° Fahrenheit in a solid, crystalline and lamellar mass, exhibiting many spots of a lead colour and metallic lustre. A great part of it remains in the solid state even at +10°. It is extremely volatile, and produces dense vapours in the atmosphere. It boils between 113° and 117°, and its vapours are not dissimilar to those of the nitrous acid gas, and weigh rather more than 5.0.

The vapour of bromine is a new supporter of combustion; a lighted taper is soon extinguished in it; but before it goes out,

it burns with a greenish flame at the base and red at top, as in chlorine gas. Bromine is a new conductor of electricity; when its solution is submitted to the action of a galvanic battery of a moderate strength, it accumulates on the positive pole, when its presence may easily be discovered by the smell; whilst, at the other pole, no such indication of bromine is given.

Bromine poured in sulphuric acid sinks to the bottom, and may be thus preserved in an open vessel, without undergoing any alteration. Its atomic weight, according to Liebig, is 75.288 hydrogen = 1 and 94.110 oxygen = 10; Löwig found it to be 75.76 hydrogen = 1.

COMBINATIONS OF BROMINE.

Bromine and Water.

A. *Hydrate of bromine* is produced—first, by mixing bromine with a small quantity of water and exposing the mixture to a freezing temperature; second, by conducting vapours of bromine through a glass tube wetted with water, at a temperature of 39° or 40° Fahrenheit. By the first method beautiful octahedral crystals are afforded, resembling in colour those of the ferrocyanate of potassa; by the second, a crystalline mass, without any determinate form, is deposited in strata in the tube. This hydrate is composed of

Bromine	75.76	or	1 atom,
Water	90.00		10 atoms.

This combination is not altered at a temperature below 60°; but above this point it is decomposed and resolved into bromine and water, which separate; on exposing them again to the freezing point, they combine anew to form a crystalline hydrate. In all its combinations the hydrate of bromine acts exactly as pure bromine.

B. *Solution of bromine.*—A hundred parts of water at 60° absorb three parts of bromine, and form a solution of a deep red colour. Its smell is similar to that of pure bromine, and of an astringent but not acid taste. This solution is not altered at a temperature of —4°, nor even below that degree; but at a gentle

heat, or on exposure to the air, the bromine is entirely evolved, and the fluid gives no indication of acid properties. After several weeks it is decomposed at the ordinary temperature, with generation of hydrobromic acid and evolution of oxygen; this decomposition takes place much sooner when the solution is exposed to the solar rays.

Bromine and Oxygen.

Bromic acid is the only combination of bromine and oxygen with which we are yet acquainted. It cannot be procured in a direct way, at any temperature, and has not yet been obtained in an anhydrous state. Its composition is represented by 75.76 or one atom of bromine, and 40.00 or five atoms of oxygen.

It is obtained in the liquid state by two different processes: first, by adding gradually sulphuric acid to a solution of bromate of baryta, until all this earth is precipitated, and evaporating gently the liquor; second, by Berzelius' process for obtaining chloric acid, which consists in saturating boiling water with bromate of potassa and decomposing the solution while hot with a small excess of a solution of fluo-silicic acid, which unites with the potassa and forms a salt sparingly soluble, whilst the bromic acid is liberated. After boiling the liquor for a while it should be filtered, and bromate of potassa added to it until no more gelatinous precipitate is thrown down. The bromate of potassa which has escaped decomposition is then either precipitated by alcohol, or evaporated by a gentle heat.

Liquid bromic acid, reduced by evaporation to the consistence of a syrup, is a colourless fluid; its point of congelation is still unknown. It reddens litmus, and soon bleaches it completely. Its taste is purely acid, and it has scarcely any smell. Nitric and sulphuric acids have no chemical action upon it; but the latter, when highly concentrated, produces a considerable effervescence with evolution of bromine and oxygen. This phenomenon seems to be produced by the great elevation of temperature resulting from the action of the strong sulphuric acid upon the water of the bromic acid. It is decomposed by all the hydracids, and by the oxacids which are not completely

saturated with oxygen, and is precipitated by the salts of silver, the protonitrate of mercury, and the concentrated solutions of the salts of lead.

The salts of this acid are mostly crystallizable, and are all decomposed by heat when mixed with a combustible body. They detonate either by percussion or heat, with still more energy than the chlorates, and this mixture becomes partially combustible by contact with sulphuric acid.

Bromine and Hydrogen.

A. *Hydrobromous acid* is produced by the decomposition of the bromide of potassium by sulphuric acid, and condensing in water the vapours which are evolved; or by adding bromine to a solution of hydrobromic acid. This acid has not yet been obtained in an insulated state; its solution is of a dark red colour, its smell similar to that of bromine, and its taste peculiarly acid. It dissolves gold, and is converted by heat into vapours of bromine and hydrobromic acid gas, and the liquid becomes sour, colourless, and diminishes in density.

B. *Hydrobromic acid* exists in nature in the state of combination with soda, baryta or magnesia, in sea water, in marine animals, and in almost all the salt-works. It has yet been obtained only in the state of gas; but there is no doubt that it may be reduced to the liquid state, either by pressure or by cold. Its specific gravity is 2.71. It is colourless, of a strong acid taste, and fumes considerably on exposure to air. It reddens litmus powerfully, and applied to the skin it produces a considerable inflammation and itching. It is incombustible, a non-supporter of combustion, and resembles in general appearance the hydrochloric acid gas; its composition is as follows:

Bromine	75.76	or	1 atom,
Hydrogen	1.00	or	1 atom.

The hydrobromic acid gas is soon absorbed by water, with a considerable evolution of caloric, and forms thus the *liquid hydrochloric acid*, which, in a saturated state, is a fuming liquid, possessing all the properties of a strong acid. This liquid acid is obtained, 1. By uniting bromine, phosphorus,

and a great proportion of water. The bromine must be added by small portions, for the reaction takes place with a considerable disengagement of light and caloric; the addition is continued until all the phosphorus has disappeared. In this operation two acids are formed, the hydrobromic and phosphoric; the former is separated from the other by a gentle heat. 2. By adding to a watery solution of bromine some diluted hydrosulphuric acid, sulphur is precipitated and hydrobromic acid generated, which may be separated by filtration. If the bromine is not entirely dissolved, a bromide of sulphur will be produced and precipitated with the sulphur, and both will be converted into sulphurous and hydrobromic acids. 3. By distilling bromide of potassium with three-fourths its weight of sulphuric acid, previously diluted with sixteen parts of water; by exposing the product to the air, the bromine which may have passed over uncombined escapes.

Liquid hydrobromic acid is colourless, and its specific gravity, when concentrated, is 1.29; its point of congelation is still unknown. In the state of concentration it disengages a great abundance of thick fumes, and boils the sooner as it is more concentrated, evolving a portion of its hydrobromic acid gas; at a small degree of concentration it boils only at a temperature above 212°. Similar in this respect to the hydrochloric acid, a strong solution of hydrobromic acid is rendered weaker by ebullition, whilst a weak solution gently evaporated becomes stronger. The evaporation must not be done at the point of ebullition, otherwise all the acid should be driven off. Its taste is very acid. Liquid hydrobromic acid, as well as the hydrobromic acid gas, is decomposed by chlorine, sulphuric and nitric acids, and the metallic oxides.

Bromine and Carbon.

These two bodies do not combine in a direct manner; but when bromine is dissolved in ether, alcohol, oil of turpentine or other vegetable liquids, a portion of bromine unites with the hydrogen of these liquids, and form hydrobromic acid, whilst another portion combines with their carbon and gene-

rates a bromide of carbon; and a third portion unites to both carbon and hydrogen, and constitutes the hydrocarburet of bromine.

A. *Liquid bromide of carbon* is prepared by introducing in a glass tube two parts of bromine and one part of iodide of carbon. The latter is instantly decomposed with a great development of caloric, and a hissing noise similar to that produced by plunging in water a piece of red hot iron. One part of the bromine unites with the carbon of the iodide of carbon and forms the liquid bromide of carbon, whilst the other part combines with the liberated iodine and constitutes a bromide of iodine. The whole is then treated with water, which dissolves the bromide of iodine and precipitates the bromide of carbon. The latter retains a little bromine, which colours it; it is purified by the addition of a sufficient quantity of caustic potassa.

Liquid bromine of carbon is colourless, very volatile, much heavier than water; its smell is penetrating and ethereal; it has a taste exceedingly sweet, which it communicates to water, although sparingly soluble. It becomes solid at from 41° to 43° Fahrenheit, and acquires the consistence and friability of camphor.

It is composed of carbon 6 and bromine 75.76, or one atom of each. It is not altered by exposure to the air, even in its colour, as the iodide of carbon is.

B. *Dry bromide of carbon* is obtained by dissolving bromine in alcohol, of 36° of Baume's areometer. A considerable effervescence takes place, with development of heat, and evolution of vapours of hydrobromic acid and of bromine. When this solution is cooled, add to it a solution of caustic potassa, until the mixture becomes colourless, then dilute with water and evaporate gently the alcohol. As soon as the liquor begins to cool, a small quantity of lemon coloured oil, heavier than water, separates, and forms in a short time a crystalline mass, similar to camphor. This peculiar substance may be purified by solution in alcohol and precipitation by water. It is white, lamellar, resembling camphor, friable, greasy to the touch and heavier than water; melts at a moderate heat,

and evaporates at 212°, subliming by the contact of cold bodies. Its smell is pleasant, somewhat similar to that of nitrous ether; its taste is sharp and burning, becoming sweet and producing a sensation of freshness not dissimilar to that of peppermint; its composition is the same as the preceding.

This substance dissolves in water at 122°, and the solution acquires the same flavour and evaporates at a higher temperature. In its liquid state it is transparent and colourless. In contact with the flame of an alcohol lamp, it burns with emission of hydrobromic acid gas; but it goes out soon after having been removed from the flame.

C. *Hydrobromide of carbon* is prepared by introducing some bromine in a receiver filled with olefiant gas; or by mixing bromine and sulphuric ether. If the former be in excess, a great quantity of caloric is disengaged and hydrobromic acid is instantly produced. This mixture, submitted to distillation, yields first some hydrobromic acid, and very soon after an oily fluid passes over, which it is necessary to receive in another vessel; the distillation is stopped as soon as about two-thirds of the whole mixture has passed over. The last product is well washed with a solution of potassa, in order to separate the acid which may have passed with it.

It is an oily and colourless fluid, of specific gravity 2.78 to 3; it does not redden litmus paper. Its taste is sweet, aromatic, ethereal, and more agreeable than that of the hydrochloride of carbon. Its composition is as follows:

Carbon	12	2 atoms	} carburetted hydrogen gas,
Hydrogen	02	2 atoms	
Bromine	75.76	1 atom.	

Transmitted through a red hot glass tube, it is converted into carbon and hydrobromic acid gas; in contact with ignited bodies it burns with a green flame, evolution of hydrobromic acid gas, and with a thick smoke of divided charcoal. It is sparingly soluble in water, but is dissolved easily in alcohol, ether, and concentrated acetic acid. These solutions are precipitated by water.

Bromine and Boron.

This combination is not yet perfectly ascertained.

Bromine and Phosphorus.

A. *Sesquibromide of phosphorus* is obtained by adding to bromine, perfectly free of water, small pieces of phosphorus of about one-fourth of a grain, until the red colour of bromine has disappeared entirely. The sesqui bromide of phosphorus is freed from the excess of phosphorus by distillation. It is a limpid and colourless fluid, even at 10° Fahrenheit, very volatile, smoking in the air, of a smell similar to that of hydrobromic acid. When entirely freed from water, it has no action on litmus, but it slightly reddens it when it contains any moisture. It is composed of

Phosphorus	16	or	1 atom,
Bromine	113.64	or	1.5 atoms.

It is soon decomposed by warm water, and alkaline and metallic solutions; but cold water acts very slowly upon it; it sinks to the bottom and is decomposed only after long shaking.

B. *Perbromide of phosphorus* is obtained by uniting the sesqui bromide with more bromine. It is solid and of a yellow colour; it melts at a pretty high temperature, and forms in the air thick vapours of a fetid smell. Its composition is

Phosphorus	16	or	1 atom,
Bromine	189.40	or	2½ atoms.

It is converted by water into phosphoric and hydrobromic acids, with a considerable evolution of caloric; by metals, into metallic bromides and phosphurets; and by metallic oxides, into bromates and phosphates.

Bromine and Sulphur.

A. *Subbromide of sulphur.*—Bromine in contact with sulphur forms an oily fluid. Seventy-five parts of bromine, at a common temperature, take up thirty-two parts of sulphur. It is of a reddish colour, much darker than the chloride of sulphur. Its smell is unpleasant, and almost similar to that of

the latter compound. Its taste is hot, bitter and sour, but it does not redden litmus paper. It is formed of two atoms of sulphur and one atom of bromine.

B. *Simple bromide of sulphur* is obtained by distilling the subbromide of sulphur, when the excess of sulphur remains in the retort; or by adding to the subbromide as much bromine as it already contains. It is a red and limpid fluid, heavier than water, very volatile, fuming in the air, and swelling as the subbromide. Its taste is very acid and hot, but it does not redden litmus. It contains one atom of sulphur and one of bromine.

When vapours of bromide of sulphur come in contact with red hot iron, combustion takes place, bromine is liberated and sulphuret of iron produced. It is slowly decomposed by cold water, detonates feebly with boiling water, and is converted into hydrobromic, sulphuric, and hydrosulphuric acids; it is also decomposed by nitric acid and ammonia.

C. *Bromide of carburetted sulphur.*—Bromine and carburetted sulphur combine very easily together, and form a red and transparent fluid, heavier than water, and very fetid; water has no action upon it, but the fixed alkalies and ammonia form with it bromates and hydrobromates, and liberate the carburet of sulphur.

Bromine and Selenium.

These two bodies form together different combinations; two parts of selenium and five of bromine appear to be the most lasting compound. Pulverized selenium mixed with bromine produces a noise similar to that of a red hot iron plunged into water, disengages a considerable quantity of caloric, and in a moment is converted into a solid mass, of a reddish brown colour. It fumes in the air, and its smell resembles that of chloride of sulphur. Poggendorff considers it as a mixture of deuto and trito bromides of selenium. It dissolves in water, and forms a colourless solution when there is no free bromine present.

Bromine and Iodine.

A. *Subbromide of iodine.*—This compound is obtained by mixing bromine and iodine and submitting them to distillation; vapours of a brownish red colour are disengaged, which condense in tufts of fern-like crystals.

B. *Protobromide of iodine* is prepared by adding another portion of bromine to the above compound. It forms a dark brown fluid of an unpleasant smell and of a sharp taste, bleaches litmus without previously reddening it, and is composed of one atom or 125 parts of iodine, and one atom or 75.76 parts of bromine. It is soluble in water, and gives to that liquid the bleaching property; and is decomposed by the alkaline solutions, and converted into hydrobromate and iodate, without separating any of its constituents. By introducing gaseous bromine into water at 26° Fahrenheit, containing a small quantity of iodine, the latter is instantly dissolved, and soon after lanceolate crystals of a dark yellow colour are produced. These crystals are an *hydrate of bromide of iodine*, composed of

Iodine	1 atom	or	125.00,
Bromine	1 atom	or	75.76,
Water	10 atoms	or	90.00.

The hydrate of bromide of iodine remains solid at 40°, but above that point it separates into bromide of iodine and water, retaining a small quantity of the latter.

Chlorine and Bromine.

Chloride of bromine is produced by transmitting a current of chlorine through bromine, and condensing the vapours by means of a freezing mixture. This compound is a reddish yellow fluid, rather lighter than bromine itself. Its smell is penetrating, and its taste very unpleasant. It is very volatile; its vapours are of a dark yellow colour, and it bleaches litmus without reddening it. The composition is

Bromine	75.76	or	1 atom,
Chlorine	35.40	or	1 atom.

Metals burn in chloride of bromine, with generation of metal-

lic chlorides and bromides. It is decomposed by the alkaline solutions. At the freezing point it forms with water a crystallized hydrate, of a light yellow colour, composed of one atom of chlorine, one of bromine, and ten of water. Chloride of bromine dissolves easier in water than the bromide of iodine, and without decomposition. It forms a yellowish solution, possessing the smell of both chlorine and bromine.

Hydrochlorate of bromine.—Concentrated hydrochloric acid dissolves a large quantity of bromine; the solution resembles in colour, smell, and power of dissolving gold, the hydrobromic acid.

Nitrogen and Bromine.

It is not yet ascertained whether by treating bromine with ammonia, or with the ammoniacal salts, a combination can be produced, analogous to that obtained with chlorine and iodine; but cold nitric acid dissolves about as much bromine as pure water does, and acquires a yellowish red colour. Heat disengages bromine from this combination.

Hydrobromate of ammonia is obtained by saturating a solution of ammonia with hydrobromic acid and evaporating the liquid; by combining equal volumes of ammoniacal and hydrobromic acid gases, or by treating bromine with ammonia. The decomposition of bromine by ammonia is attended with a considerable evolution of caloric; nitrogen is disengaged, whilst bromine unites with the hydrogen, and combines with the undecomposed ammonia, to form an hydrobromate. It is solid, white, but on exposure to air it becomes yellow, and seems to be transformed into a hydrobromate by yielding a portion of its hydrogen to the oxygen of the atmosphere. It crystallizes in long prisms, covered with smaller ones, forming right angles with the former, and heat vaporizes it without decomposition on melting. Its taste is sharp and salt. It is composed of one atom or 17 of ammonia and one atom or 75.76 of hydrobromic acid.

Bromate of ammonia is produced by mixing liquid ammonia with liquid bromic acid; it crystallizes in acicular crys-

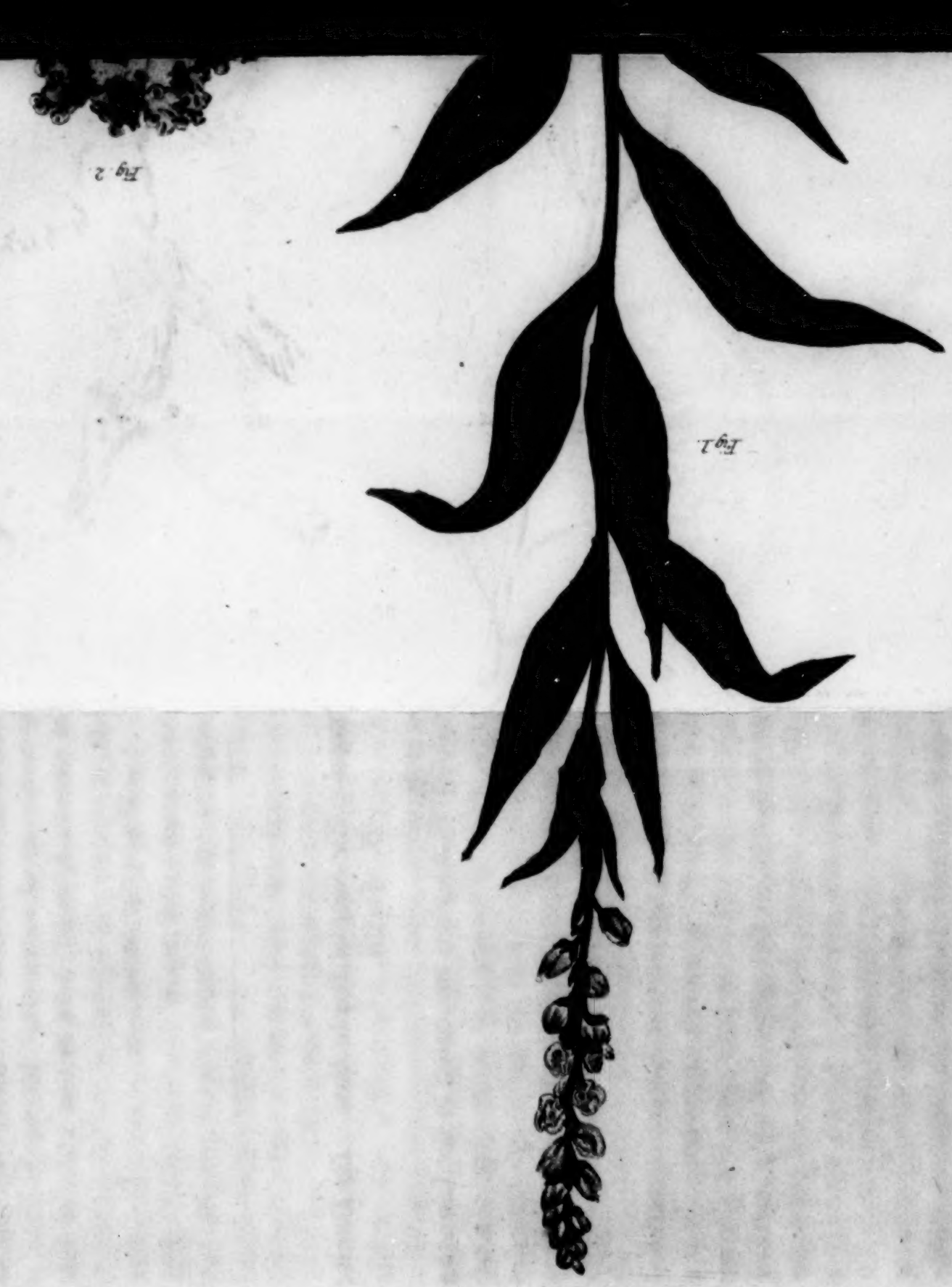

Table 36.

Fig. 1

3 4 5 6 7 8

Fig. 2

Drawn from Nature by W.P.C. Barton

Tanner, Vallance, Kearny & Co. sc

POLYGALA SENEKA.

(Seneka Snake-root.)

tals and sometimes in grains. Its taste is sharp and cooling. It is converted by a gentle heat into bromine and nitrogen, which are disengaged, and into hydrobromate of ammonia. This compound may also be obtained by treating the bromate of baryta by the carbonate of ammonia. Its composition is 17 or one atom of ammonia, and 115.76 or one atom of bromic acid.

[To be continued.]

On Polygala Senega. The Seneka Snake Root. By Daniel B. Smith.

The Seneka Snake Root is a plant belonging to the Linnæan class Diadelphia, and order Octandria. It is the type of a natural order called Polygaleæ, to which the Krameria Triandra also belongs. The leaves of the polygaleæ have generally a bitter astringent taste, which is much stronger in the roots, combined with an acrid and somewhat resinous flavour. This genus is a beautiful example of the manner in which occasional irregularities in structure are compensated by nature. When we examine the stamens, we find them possessing the character of the Leguminosæ, one of the most distinctly marked of all the natural orders. Instead, however, of the papilionaceous flower, with its keel and banner and wings, we have a tubular corolla approaching to the character of the labiatæ. To make up for the absence of the wings, the two lateral segments of the calyx are expanded into roundish-ovate, flattened, wing-like leaves, which are white, like petals, and may be considered as a part either of the calyx or corolla.

"The polygala senega has a firm hard branching perennial root, consisting of a moderately solid wood and a thick bark. This root sends up a number of annual stems, which are simple, smooth, occasionally tinged with red. The leaves are

scattered, nearly or quite sessile, lanceolate, with a subacute point, smooth, paler underneath. Flowers white, in a close terminal spike. The calyx, which in this genus is the most conspicuous part of the flower, consists of five leaflets, the two largest of which, or wings, are roundish ovate, white and slightly veined. Corolla small, closed, having two obtuse lateral segments, and a shorter crested extremity. Capsules obcordate, invested by the persistent calyx, compressed, two celled, two valved. Seeds two, oblong ovate, acute at one end, slightly hairy, curved, blackish, with a longitudinal, bifid, white appendage on the concave side. The spike opens gradually, so that the lower flowers are in fruit while the upper ones are in blossom."—*Bigelow.*

The Seneka snake root is a native of every part of the United States; though it is most abundant in the southern and western states, where it is collected in great quantities, and exported in bales of from two to four hundred weight. The root, as it occurs in commerce, varies from the size of a small quill to that of the little finger. It presents a thick knotty head, which exhibits the traces of the numerous stalks, and from which proceeds a moderately thick, tapering root, that is branched, twisted, and covered with a corrugated, transversely cracked epidermis, which is yellowish brown in the young, and brownish gray in the old roots. The root frequently exhibits crowded annular protuberances, and has a projecting keel-like line extending along its whole length. The bark is thick, hard and resinous, and contains the active principle of the plant: the central woody part is white and inert.

Seneka snake root has a faint aroma, which is, at first, not unlike that of ginseng, but soon becomes nauseous. The taste is at first mucilaginous and sweetish, and being chewed becomes somewhat pungent and acrid, and produces a very peculiar irritating sensation in the fauces. These properties are communicated to the watery decoction, which is more acrid than the alcoholic tincture; and although not unpleasant to the taste at first, soon manifests the peculiar pungency of the root, spreading through the fauces, or exciting a copious discharge of saliva, and frequently a short cough. Seneka snake

root communicates neither taste nor smell to water distilled from it. Alcohol extracts its virtues; and the tincture is decomposed by the addition of water, which precipitates a resinous principle. "Iron produces little change in solutions of this root, and gelatin occasions no alteration whatever."

M. Peschier, of Geneva, obtained from six ounces of Polygala, one hundred grains of a principle which he calls *polygaline*, and supposes to be alkaline in its nature; he thinks it is united to a new acid, which he calls the *polygalinic*. He also pretends to have discovered another substance in this plant which he calls *isolysine*. These results, however, have been called in question. M. Feneulle, pharmaceutist at Cambray, has also analysed this plant, and obtained, 1st, pale yellow colouring matter; 2d, bitter substance; 3d, gum; 4th, pectic acid; 5th, albumen; 6th, volatile oil; 7th, fat oil; 8th, acid malate of lime and other salts, with a base of potassa, lime and silex. Another analysis, by M. Dulong d'Astafort, gave the following results: 1st, peculiar alkaline matter; 2d, resin; 3d, gummy matter (mucus); 4th, colouring matter analogous to wax; 5th, yellow colouring matter; 6th, matter coloured red by sulphuric acid; 7th, pectic acid; 8th, acid malate of lime and potassa; with other salts having bases of potassa, lime and iron. Finally, an analysis of M. Folki produced, 1st, a thick oil, in part volatile; 2d, free gallic acid; 3d, wax; 4th, an acrid principle; 5th, yellow colouring matter; 6th, azotated matter; 7th, various salts. The whole virtues of the plant are extracted by proof spirits, although the decoction is for practical purposes the most efficacious preparation.

The Seneka snake root is often mixed with the roots of ginseng (Panax quinquefolium) to which admixture, perhaps, the peculiar smell of fresh Seneka may be ascribed. It grows in the neighbourhood of Philadelphia, in the woods below the falls of Schuylkill, and at the Friends' Asylum for the insane near Frankfort.

It enters into most of the officinal lists, and is celebrated as a sudorific and expectorant in small doses, and an emetic and cathartic in large ones.

The following account of its officinal preparations is chiefly extracted from the "Pharmacopée Universelle."

Extractum Senegæ Radicis. (*fu. pr. s.*)

℞ Rad. polygalæ senegæ	℔j.
Spiritûs vini gallici	℔vj.

Digest for some days in a gentle heat, filter the tincture, and evaporate to the consistence of honey. Boil the marc with three pounds of water, strain and evaporate to the same consistence; mix the two extracts and reduce to the proper consistence. (*fu.*)

℞ Radicis senegæ	℔ij.
Aquæ	℔ix.
Alcoholis	℔iij.

Digest for twenty-four hours, distil off the alcohol, and reduce the rest to a proper consistence. (*pr. s.*)

Dose six to fifteen grains.

Tinctura Senegæ. (han. *vm.*)

℞ Radicis senegæ	1 part,
Alcohol	6 parts.

Infuse in the cold for several days. (*vm.*)

Han. directs five ounces of the root and two pounds of alcohol.

Dose thirty drops several times a day.

Decoctum Senegæ.

℞ Rad. senegæ	℥j.
Aquæ	℔ij.

Reduce to one half by ebullition, (am. ed. lo. wu. ww. *br. c.*) b.* prescribes three ounces of root, and two pounds of water reduced to one-third; fu. and g. one ounce of root to a pound and a half of water, reduced to a pound.

℞ Rad. senegæ	℥j.
Aquæ	℔ij.

Boil and reduce to one pound, strain, and add syrup. simplicis ℥j. (*sa. sw.*)

℞ Rad. senegæ	℥j.
Glycyrrh. glab.	℥ss.
Aquæ	Oiss.

Boil and reduce to a pint. (*e.*)

Syrupus Senegæ.

℞ Rad. senegæ	℥j.
Aquæ bullient.	Oiss.

Reduce by boiling until ten ounces of the strained liquor are left; add sacch. alb. ℔iss.

Make a syrup. (b.* fi. han. po. pr. su.)

℞ Rad. senegæ	1 part,
Aquæ	12 parts.

Infuse with a gentle heat, in a covered vessel, for several hours; strain the infusion, and add of white sugar eighteen parts. Make a syrup. (*vm.*)

Decoctum Diureticum.

℞ Rad. senegæ contus.	℥ss.
Scillæ incis.	℈j.
Aquæ	℥xij.

Boil down to one-third, strain, and add

Spiritus æther. nitr.	℥ij.
Tinct. opii	℈ij.
Mel. glycyrrhizæ	℥j. (hum.)

Decoctum pectorale corroborans, Haustus pectoralis incitans.

℞ Rad. senegæ	ʒij.
Aquæ	q. s.

to obtain six ounces of decoction, to which, after it is strained, add oxymel scillæ ℥i. Misce. (*b.*)

℞ Rad. senegæ ʒij.
Aquæ q. s.
to obtain eight ounces of decoction; to which, when strained, add camphor (triturated with mucilage of gum arabic) ʒi.
M. (*b.*)

℞ Rad. senegæ ʒij.
Decoct. cinchon. bullient. q. s.
to obtain seven ounces of strained liquor; add
Camphor (triturated with mucilage of gum arabic) ʒss.
Æther. sulphuric. gutt. xxx.
Syrup. cortic. aurant. ℥j.
Syrup althææ ℥i.
M. (*b.*)

℞ Rad. senegæ ʒss ad ʒi.
Rad. glycyrrh. ʒij.
Aquæ ℥iij.
Infuse, and add to the strained liquor tinct. opii camph. ʒi. syrupi althææ ʒiv. M. (*aw.*)

Dr Coxe's Hive Syrup is prepared by making a decoction of equal parts of senega and squills in sixteen parts of water boiled down to eight parts. The strained liquor is then boiled with four parts of clarified honey to the consistence of a syrup, and a grain of tartarized antimony added to every fluid ounce of the syrup.

It is a popular remedy in this city in croup and recent coughs, and is much used. As generally prepared, it is a very inelegant preparation, and resembles a sweetened decoction rather than a syrup. A preparation having similar virtues has been made in the following manner; and possesses these advantages over the formula of Dr Coxe, that it requires less boiling, and is more uniform in its results. There can be no doubt that maceration for some hours in boiling water,

in a covered vessel, will extract all the active principles that water is capable of taking up from the roots.

℞	Rad. senegæ	℥viij.
	Rad. scillæ siccatæ	℥viij.
	Aquæ bullient.	Oiv.

Macerate in a covered vessel near the fire for four or five hours, and press and filter the infusion, which will measure about two and a half pints. Then add mel. clarificat. ℔iv. sacch. alb. ℔ij. Boil to the consistence of a syrup, and to every ounce of the syrup add a grain of tartarized antimony.

On Weights and Measures. By Benjamin Ellis, M.D.

From a work on the elements of pharmacy by Samuel F. Gray, we republished part of a chapter on weights and measures in the third number of our Journal; and as it made some more pretensions to research than we usually find in similar works on the same subject, a few editorial remarks were prefixed, recommending it to the attention of our readers. Since that time I met with the report made to the senate on weights and measures by John Quincy Adams, Esq. when secretary of state of the United States, in the year 1821.

This report displays great research and profound learning, and occupied the secretary four years in its preparation. As I consider it to be a standard work on weights and measures, and as the author of the elements of pharmacy appears to have committed some mistakes in reference to the early history and changes in the British system of metrology, I shall draw from the report the materials for an essay on the subject.

Weights and measures are so interwoven in the whole fabric of society, so indispensable to almost every transaction in the arts and sciences, and in trade, and the facts so abundant, that it seems difficult to avoid redundancy, and to mould to a

popular form, a subject, abstract in its nature and depending on calculation. But as these instruments are so immediately connected with the business of the apothecary, their history and theory must be interesting to him. I shall therefore endeavour, as concisely and clearly as possible, to present him with a view of the principles on which the ancient English and modern French systems of metrology are founded. As preliminary to the discussion of these matters it may be proper to remark, that uniformity in weights and measures has, since any attention has been paid to the subject by human governments, been a great and leading object with statesmen and philosophers. To accomplish this, the most powerful talents and untiring perseverance have been enlisted, but hitherto without success. It is not necessary to state these difficulties in detail, but they are founded in the nature of man, the limited power of the most absolute monarchs, and the physical constitution of things. Uniformity in weights and measures may have reference to several objects, but I shall confine myself to its relation to these instruments themselves. In these respects it may be either of identity or of proportion. "By a uniformity of identity is meant a system founded on the principle of applying only one unit of weights to all weighable articles, and one unit of measures of capacity to all substances thus measured, liquid or dry.

"By an uniformity of proportion is understood, a system admitting more than one unit of weights, and more than one of measures of capacity; but in which all the weights and measures of capacity are in an uniform proportion to each other."

From the names given to many of our measures, such as the foot, cubit, span, pace, &c. we find that primitive man must have derived these standards from his own person. In adapting the skins of animals to his body for clothing, he would discover the standard for the measure of length, and the subdivisions of that standard.

Superficial measures, vessels of capacity, and the length or distance from one point on the earth's surface to another will

naturally spring from the wants of domestic society. Linear measure may be made a measure of circumference; but while the man would employ the cubit or forearm for ascertaining the length of his house or his cabin, he would make use of the pace to mark distances on the surface of the ground.

These natural standards are constantly referred to, by the civilized man as well as the savage, by the philosopher as well as the peasant.

But we have, in the instance before us, a source of diversity in linear measure, flowing from the constitution of man and his relations with the physical world. We have two standards for measures of length, and, as will be shown, not reducible into each other.

Measures of capacity are rendered necessary for holding fluids, and those fruits and seeds which are so abundantly supplied by the earth, and which, to be measured or confined, must be surrounded by vessels of compact and uniform substance.

These however cannot be derived from his own person, and he must look abroad, into the great store-house of nature, for the shell of some large gourd, or the cast off covering of some testaceous fish.

In the infancy of human society, a common standard not being wanted, these measures will be of various dimensions.

When linear measure comes to be applied to the mensuration of surfaces and solids, the necessity of numbers will become apparent, and these will be supplied to man in the number of his fingers. The elements of decimal arithmetic, as well as linear measures, are thus to be found in the members and divisions of the human body. But though admirably adapted for the purposes of computation, decimal arithmetic is not equally applicable to the numeration, multiplication or division of material substances, either in his own person or in physical nature. That the human body and its members are not in the proportions of decimal arithmetic, is apparent from the following facts. The cubit for obvious reasons will be the unit or standard of linear measures. The cubit is the half of

the ell or arm, from the middle of the breast to the end of the middle finger. The fathom is the space between the extremities of the two middle fingers, with expanded arms, exactly an equivalent to the stature of the man, from the crown of the head to the sole of the foot.

By division we obtain the smaller measures: the span is equal to half the cubit, the palm to one-third of the span, and the finger to one-fourth of the palm. The cubit is thus as a measure divided into twenty-four equal parts, with subdivisions of which, two, three, and four are the factors; for the mensuration of distance the foot is found equal to one-fifth of the pace, and one-sixth of the fathom.

However beautiful and simple therefore may be the principle of decimal arithmetic, it has been found entirely inapplicable to a system of metrology. It is impossible by its rules to find the dimensions of those modifications of matter, which are usually bounded by the curved line, or of those artificial vessels, modelled after the circle or the sphere.

But in the progress of human affairs, wants, discoveries and occupations rapidly succeed each other, or go hand in hand, until the multiplied relations between man and man give rise to civil society and established governments. It must soon have been obvious, that there was a very great difference between the weight or specific gravities of equal bulks of different substances. But the use of weights not being necessary to individual or even social man, the discovery of the balance would follow the unavoidable experiments made in the barter or exchange of the productions of the earth.

"Specific gravity, as an object of mensuration, is, in its nature, *proportional.* It is not like measures of length and capacity, a comparison between different definite portions of space, but a comparison between different properties of matter. It is not the simple relation between the extension of one substance and the extension of another; but the complicated relation of extension and gravitation in one substance to the extension and gravitation of another."

It is, therefore, obviously impossible to estimate extension

and gravitation by one and the same standard. By an immutable law of nature, they are to be estimated by a different rule, and the only uniformity they admit of is that of *proportion* between their respective standards, and not of *identity*, which would refer them to one and the same unit.

As it is necessary in the use of the balance that there should be employed two substances, each of which is, or would be, the test or standard of the other, we may readily suppose that these would be taken from those most essential to society. Consequently corn and wine have been employed as the substances on which to found systems of metrology. But with the discovery of the metals and their peculiar properties, changes must have taken place in the standard of valuation. For as it would soon be found that they could only be estimated by weight, they would soon be employed as the standards for the weight and value of other things. The different specific gravities of the metals would, however, give rise to another complication and another diversity of weights and measures, since they could not be indiscriminately employed as standards of weight and value for other things.

The common sense of mankind would direct them to the selection of silver as a standard; since it possesses in a high degree those peculiar properties which distinguish this class of substances, and not equally abounding with the coarse metals, therefore of more value, and yet more abundant than gold and some others, and therefore more suitable as the universal medium of exchanges, and capable of being made by the authority of government, money, weight and coin.

The necessity for common and uniform standards of measures will spring from the nature, constitution and operations of civil society. When exchanges take place, every individual will perceive that the diversified measures adopted by each family, would lead to endless confusion and fraud. If the cubit should be assumed by common consent, on the authority of law, as the standard for measures of length, and the pace for that of motion, there will be two standards for measures of length, as was before observed, not reducible to one, because

neither is a multiple of the other. But when the discovery is made, that the foot is an aliquot part of the pace for the mensuration of motion, and of the ell for the mensuration of matter, it will assume the rank of a common standard for both, and there will be an advance towards the uniformity of identity. Primitive and individual man then requires measures of length; domestic society gives rise to measures of capacity, of surface, distance, and decimal arithmetic; civil society, government and law are the parents of weights, uniform and common standards, money, coin, and all the elements of uniform metrology.

The reflection suggested by these speculations is, that weights and measures, more or less rude or perfect, were among the primitive inventions of our race. They spring from the nature and the necessities of man, and we naturally turn to the history of those two ancient nations, the Hebrews and the Greeks, from whom the religious, civil and political institutions of civilized Europe and America are derived, for some accounts of their origin. From the writings of Moses, we learn that instruments of brass and iron were invented, at no very distant period from the creation; and though no mention is made of weights, we are told by Josephus, the Jewish historian, that they were invented by Cain, the tiller of the ground and the first builder of a city.

The cubit as a standard measure of length, as well as the use of decimal arithmetic, are of antediluvian origin. The ages of the patriarchs are noted in units, tens and hundreds of years, and Noah was directed to build his ark three hundred cubits long, fifty cubits broad, and thirty cubits in height. In the history of Abraham, after the general deluge and the confusion of languages, we find references to weights and measures. He was a Chaldean, and was very rich in cattle, silver and gold. *Measures* of meal are first noticed in this part of the Bible. Abimelech gives him a thousand pieces of silver. He gives to Hagar a *bottle* of water, and bought of Ephron the Hittite the field of Machpelah, for which he pays him by weight four hundred shekels of silver, current money with the merchant.

At this period, then, we find acknowledged and in common use, measures of length, of land and of capacity, liquid and dry; weights, coined money, and decimal arithmetic. The elements of a system of metrology were complete; but the identity of the weights, coin and decimal arithmetic comprises the only uniformity that is apparent.

In the law given from Sinai, weights and measures are referred to, and the Hebrews are commanded, "just balances, just weights, a just ephah, and a just hin shall ye have;" and again, "thou shalt not have in thy bag divers weights, a great and a small; thou shalt not have in thy house divers measures, a great and a small; thou shalt have a perfect and a just weight; a perfect and a just measure shalt thou have."

These ordinances relate to weights and measures already known and established, and which were probably brought by the children of Israel from Egypt. They require that as a nation, the standards kept in the ark of the covenant or the sanctuary should be perfect; and that individually the people should have weights and measures corresponding exactly with these standards, "and not divers, a great and a small." The cubit was the unit for measures of length, and was divided into twenty-four digits or fingers. It was not divided decimally, and was not used for itinerary measures; these were estimated by paces, sabbath day's journeys and day's journeys. The ephah was the measure of capacity for dry, and the hin for liquid substances. An egg shell was the primitive standard from nature for the latter.

The homer was the largest measure of capacity, and was common both to liquid and dry substances, very nearly corresponding with our wine hogsheads, and the Winchester or London quarter. The intermediate measures were different, and combined in their divisions the decimal and duodecimal numbers.

The weights and coins were the shekel, of twenty gerahs; the maneh of sixty shekels for weight, and fifty for money; and the kinchar or talent of three thousand shekels, both for weight and money. The original weight of the skekel was

the same as one half of our avoidupois ounce; the most ancient of weights traceable in human history. The speculative views of the origin of weights and measures are illustrated by this brief sketch of the Hebrew system of metrology. We discover from these sacred records, that measures of length and of distance are derived from the members of the human body; but the first is from the arm, and the second from the leg and foot. That the natural standards for measures of capacity and for weight are also different from linear measures, and different from each other; that the natural standards for weights are not the same, one of which is identical with metallic money:—and that decimal arithmetic, while it is admirably calculated for the standard *units* of weights and measures, is not applicable to their subdivisions or fractional parts, nor to the objects of admeasurement and weight. In the vision of the prophet Ezekiel, this system of metrology is developed, combining the uniformity of identity and the uniformity of proportion. Among the Greeks, too, the cubit was a primitive measure of length, but was superseded by the foot, when the Olympic games were instituted by Hercules.

He fixed the stadium or length of the course or stand at six hundred feet, and this afterwards became the standard itinerary measure of the nation. It was afterwards combined by the Romans with the pace, one thousand of which constituted the mile. These are our standard measures of length at this day. The foot has many advantages over the cubit, not the least of which are that it is an aliquot part both of the pace and the fathom. It has therefore been universally adopted by modern Europe, while the cubit, that ancient antediluvian standard, has been abandoned.

The origin of the Greek weights and measures of capacity is not distinctly known, but it is ascertained that their uniformity was that of proportion and not of identity.

Their weights corresponded as our troy and avoidupois weights, and their measures as our wine and ale gallons; not indeed in the same proportions, but in the proportions to each other of the weight of wine and oil.

Like the Hebrews, they had dry and liquid measures, which were the same, but with different multiples and subdivisions. These measures for wine and oil were determined by *weight*, those for water and grain by vessels of capacity cubed from measures of length.

The Romans derived their weights and measures from the Greeks. They had two pound weights, termed the metrical and scale pound. "The scale pound, says Galen, determines the weight of bodies; the metrical pound, the contents or quantity of *space* which they fill."

Their measures of capacity for wet and dry substances were multiplied and divided differently from the Greeks, but were like them formed by the two different processes of cubing the foot, and testing wine and oil by weight.

The Roman amphora, was the largest vessel for liquids; it contained eighty pounds of water, and being formed by cubing the foot, was called the quadrantal. But any vessel containing ten metrical pounds weight of wine was their congius or unit for liquid measures. The sextarius was the sixth part of the congius, and was used for substances as well dry as liquid. The *pondo* or money pound, and the *libra* or metrical pound, were in the proportion to each other of eighty-four to one hundred, nearly the same as that between our troy and avoirdupois weights.

There is still at Rome a standard congius of the age of Vespasian, and the inscription which it bears states that it contains ten pounds of wine.

It is probable that before the conquest of Britain by the Romans, the Britons had a system of metrology different from that which was introduced by these masters of the world. The yard or *girth* was a measure of Saxon origin, not derived from the foot or forearm of the ancient Greeks or Hebrews, but from the circumference of the body.

The Britons no doubt, however, derived that system from the Romans, which from very early times they are known to have possessed. Its elements, the pound, ounce, foot, inch, and mile, sufficiently indicate its origin. But the *girth* cor-

responding with the Roman ell or ulna, would, when added to this system, create confusion, and is therefore said to have been finally adjusted by the arm of Henry I. made a multiple of the foot, and thus adapted to the remainder of the system. Whatever may have been the perfection of the Roman metrology at its introduction, there can be no doubt that it suffered considerable changes, during the barbarous ages preceding the Norman conquest, and while the kingdom was divided into the different governments of the Saxon heptarchy.

By slow degrees could any uniformity be introduced, applicable to the whole of a people, so long subject to feudal lords or petty though absolute kings.

William the conqueror, though an unlimited monarch, we are told, attempted no innovation on the existing system of weights and measures, whatever it was.

In his statute on this subject, he says, "we ordain and command that the weights and measures, throughout the realm, be as our worthy predecessors have established." One of the principal objects of the great charter of Henry III. 1225, was to establish uniformity in existing weights and measures, and not to innovate on the usages and customs of the people. The words of the statute are, "one measure of wine shall be through our realm, one measure of ale, and one measure of corn, that is to say the *quarter* of London; and one measure of dyed cloth, that is to say two yards (ulne) within the lists; and it shall be of weights, as it is of measures.

It has been supposed that this statute meant to establish the uniformity of identity and not of proportion, by commanding one measure of ale, wine, and corn. That the unit of all these should be one and the same, and but one unit of weights. But this could not have been the case, or the act would not have referred to the London quarter as an established measure, and one which was never used for wine. But it meant that the wine and corn or ale gallons should bear the same proportion to each other in size, as wine bears to wheat in weight. And that there should be the same proportion between the money and the merchant's weights, as between the

wine and corn measures. This construction will be further proved and illustrated by the act called the assize of bread and ale, passed in the 51st of Henry III. 1266. After providing for the price of bread, according to the price of wheat, and the price of ale by that of wheat, barley and oats, it proceeds; that by the consent of the *whole realm* of England, the measure of the king was made; that is to say, that an English *penny*, called a sterling, round and without any clipping, shall weigh thirty-two wheat corns in the midst of the ear; and twenty pence do make an ounce, and twelve ounces one pound, and eight pounds do make a gallon of wine, and eight gallons of wine do make a London bushel, which is the eighth part of a quarter.

In the 31st of Edward I. 1304, this statute was repeated in nearly the same words, though varying them slightly so as to make the meaning more clear. It states that eight pounds of *wheat* do make the gallon; and after enumerating articles sold by the merchant's weight or pound of fifteen ounces, among which are wheat and wine, finally adds "it is to be known, that every pound of money and of medicines consists only of twenty shillings weight; but the pound of all other things consist of twenty-five shillings. The ounce of medicines consists of twenty pence, and the pound contains twelve ounces; but in other things the pound contains fifteen ounces, and in both cases the ounce is of the weight of twenty pence.

These two statutes unfold the theory of the ancient weights and measures of England, and we discover that the system was not one of blind chance, but reduced to a beautiful and harmonious order. The same features are observable in it, that are impressed on the Greek and Roman metrologies. It furnishes two pound weights. One of twelve ounces, to be used for bullion or in the mint, and for pharmaceutical purposes; and, whatever S. F. Gray may think of it, this practice did not originate with the Norman lords, but was probably derived from ancient Greece and Rome, long before William the Conqueror set his foot on the soil of England. The pound of fifteen ounces, like our avoirdupois, was used in all manner of

merchandize, including wheat and wine, except gold and medicines, and these pounds bore the same proportion to each other as the weight of wheat bears to that of wine.

The statute has been censured for taking kernels of wheat as the natural standard of weights, inasmuch as they must vary in weight, in different seasons, and even in different fields in the same season. But it must be observed that it takes thirty-two grains of *average* wheat, which were found equal to the silver penny sterling. The numeration of corn was then dropped, and the multiplied weight of the penny was employed to form the pound. A vessel when filled with *wheat* that would balance eight of these twelve ounce pounds, was made the *wine* gallon; and a vessel filled with wheat that would balance a keg containing eight of these gallons of wine, deducting the tare of both, was the *measure* of the bushel. The whole process is simple and beautiful; wheat is made the standard for the weight of silver money, and silver money the standard for the weight of wheat. The weight of wheat is employed to make the wine gallon *measure;* and the *weight* of wine to make the *bushel measure* for wheat. This bushel, divided into eight parts, would furnish a half peck or beer gallon containing a greater number of cubic inches than the wine gallon, because the specific gravity of wheat is less than that of wine, and of course an equal weight will occupy a greater space.

These two gallons however bore the same proportion to each other as there was between the two pounds of twelve and fifteen ounces; the same proportion as between the commercial and nummulary weights of the Greeks, and as there is between our troy and avoidupois pounds.

It appears that, antecedent to the statute of 1266, the wine gallon had been made by dividing the ton of shipping, a process entirely different from that of employing the weight of wheat. In the one case this measure was made by beginning with the kernel of wheat, and multiplying; in the other by taking the ton of shipping, which was ascertained by linear measure, and dividing.

Now the ton of shipping was of thirty-two cubic feet by

measure and weighed 2560 of the easterling or tower pounds. By dividing the *weight* of the ton by the *cubic measure*, we find a cubic foot to contain eighty pounds of wine: and this, be it observed, was the quadrantal or amphora of the Romans. The eighth part of this amphora will give the gallon of ten money and eight commercial pounds weight.

A cubic foot contains 1728 cubic inches, and this divided by eight will furnish the gallon above named, containing two hundred and sixteen cubic inches.

But it must be borne in mind that this gallon of two hundred and sixteen cubic inches was in reality a measure for water; it was an aliquot part of the ton of shipping. Our forefathers considered the specific gravities of wine and water as identical; but the wine of Gascoigne, referred to in all these old statutes (the claret of the moderns), was in proportion to water as 9935 are to 10,000.

The gallon of two hundred and sixteen solid inches contained then, it appears, eight commercial pounds of water; but this fluid being of greater specific gravity than wine, a measure to hold the same number of pounds of the latter would be of more than two hundred and sixteen; it would be of 217.6 cubic inches. These then were the dimensions of the water gallon derived from the ton of shipping, and the Bourdeaux wine gallon containing eight easterling pounds of wheat, according to the theory in the statute of 1266.

The standard wine gallons of these dimensions have been lost in the revolutions of the kingdom; but the weights and measures of England were established in Ireland as early as the year 1351. The changes which have occurred in the British system of metrology have not extended to Ireland, at least so as to affect the wine gallon; and it is found that this measure in Ireland is neither more nor less than 217.6 cubic inches. The specific gravity of Gascoigne wine being to that of wheat as 143 is to 175, this Irish gallon of wine balanced against a corn gallon would yield one of the dimensions of 266.17 cubic inches. A corn gallon or half peck, still extant, of the year 1228 was examined by a committee of the house

of commons in 1758 and found to contain 266.25 cubic inches. This half peck then and the Irish wine gallon of the present times were both made according to the statute of 1266, and with an accuracy which all the refinements of the present age could scarcely surpass. This system of weights and measures, unfolded more fully in the statutes of Henry III. and his son Edward I., was evidently not introduced by either of these sovereigns. Henry III. was the eighth king of the Norman race, and the act of 1266 was passed precisely two hundred years after the conquest, and was undoubtedly nothing more than a development of the principles laid down in the great charter of 1225 in the same reign. This charter was designed not to innovate; but establish existing weights and measures, and to guard against fraud and oppression.

This system bears a similitude in its general features with that of the ancient Romans, as displayed in the amphora, or cubic foot, containing eighty easterling or tower pounds of wine, and the congius of Vespasian, still extant, holding, like the wine gallon of 1266, ten of the same pounds. The scale and metrical weights of the Greeks, described by Galen, from which the Roman weights were derived, coincide with the old nummulary and commercial pounds of England. The system of the Hebrews, already alluded to, was founded on the same general principles; and thus we find that of Britain may be traced to Egypt and Babylon, those seats of ancient splendour and civilization.

But the beauty and symmetry of this system of weights and measures was first defaced by Edward I. himself, by debasing the coin, and thus destroying its identity with the money weight. His successors completed its ruin by an extension of the same practice, and by confounding the penny-weight troy with the silver penny sterling.

For more than five hundred years the pound had been coined into two hundred and forty of those pennies, one of which was equiponderant with thirty-two grains of wheat in the midst of the ear.

In the year 1328 Edward I. coined the same pound into

two hundred and forty-three pennies of the same standard alloy. The penny thus lost for ever its *sterling* weight, though it retained the name. Edward III. increased the number of pennies in the pound to three hundred, or twenty-five shillings, and thus rendered it equivalent to only twenty-five and three-fifths kernels of wheat, instead of thirty-two. These short-sighted monarchs probably did not perceive that they were thus taking away the key-stone to that beautiful and compact fabric on which the happiness and prosperity of their people so much depended. But such was the fact, and the evil is irremediable.

The standards made after the statutes of 1266 and 1304, and kept in the royal exchequer, finally became injured or destroyed, and called for renovation.

Henry VII. in 1494, after the cessation of the civil wars of York and Lancaster, undertook to furnish forty-three of the principal cities with copies of the standards in the exchequer. For some cause not known, these all proved to be incorrect, and they were accordingly ordered to be returned, and parliament attempted to provide a remedy for the evil at the next session in 1496.

This statute unfolds a theory for weights and measures which produces very different results from those of the acts already so often referred to. It ordains "that the measure of the bushel contain eight gallons of wheat; that every gallon contain eight pounds of wheat, *troy* weight, and every pound contain twelve ounces of troy weight, and every ounce contain twenty *sterlings*, and every sterling be of the weight of thirty-two corns of wheat that grew in the midst of the ear, *according to the old laws of the land;*" and the new standard gallon after the said assize, was to be made to remain in the king's treasury for ever. This statute was evidently designed to be a repetition of the act of 1304, but it is very obvious that it differed widely from it.

The tower pound and troy pound were to each other as fifteen to sixteen; the penny *sterling* therefore, was one-sixteenth lighter than troy weight. But in 1496 the pound was

coined into thirty-seven shillings and six pence, and the penny sterling had ceased to be a coin, though it was still money. It, therefore, weighed little more than half what it weighed in 1304, and instead of balancing thirty-two grains of wheat, would at this time have only been equal to seventeen of these grains.

The pennyweight troy was never called a *sterling* at any time but in this statute of 1496.

It is therefore plain, that the parliament mistook the pennyweight troy for the penny sterling, and introduced this Norman weight into the composition of the gallon and bushel, instead of the old tower or Saxon pound. The gallon made by this process, as the troy weights are heavier than the others, would be larger than that of 1266. But as the bushel is ordered to *contain* eight gallons of wheat, instead of containing a *weight* of wheat equiponderant to eight gallons of wine, it will necessarily be much smaller than that of 1266. If a bushel ever was made by this process, it never was used as a standard. The measure of the gallon furnished by this statute was two hundred and twenty-four cubic inches; and held eight pounds troy of wheat, and eight pounds avoirdupois weight of Bourdeaux wine of two hundred and fifty grains troy to the cubic inch.

It is a question in the history of English weights still undecided, at what time the troy and avoirdupois pounds, with their subdivisions, were introduced and made the legal standards.

The names of both indicate a French origin; but William the Conqueror made no alteration of the kind, and from the acts of 1266 and 1304, more than two hundred years afterwards, we ascertain that they were *then* unknown in the law or trade of England. It is stated by Clarke, one of the most learned writers on the coins, that they were introduced by Henry VII. in 1496, and that it was to pay a compliment to the dutchess of Burgundy, and facilitate the exchange between Flanders and England, then established by the *intercursus magnus* or great treaty of commerce. It appears, however,

that the employment of the troy weight in the statute of 1496 was not done with the design to innovate; the object was to arrive at the size of the gallon, &c. "*according to the old laws of the land,*" i. e. of 1266 and 1304. Besides, this treaty with the Flemings was not concluded until the year after the passage of the statute.

From statutes of 1414 and 1423, in the reigns of the fourth and fifth Henry, it appears that the troy weight was then known and used by the goldsmiths, a fact which proves that Henry VII. did not introduce this weight, but mistook it for the tower or easterling pound. The troy weight was not used at the mint until the 18th of Henry VIII. 1527, as is shown by a verdict of that date remaining in the exchequer, in which are the following words: "and whereas heretofore the merchant paid for coynage of every *pounde towre* of fyne golde weighing eleven ounces quarter troye, two shillings and six pence. Nowe it is determined by the King's highness and his said councelle, that the aforesaid pounde towre shall be no more used and occupied; but all manner of golde and sylver shall be wayed by the pounde troye, which maketh twelve ounces troye, which excedith the pounde towre in weight three quarters of the ounce."

Gray, in his Essay on Weights, in alluding to the provisions of magna charta, "that there should be one weight, one measure, and one quarter of coin in the realm," observes that "the Norman lords unquestionably understood by this the French troy weight, to which they and their agents were accustomed, though the people, no doubt, considered the avoirdupois to be that entitled to this distinction." He further states "that in 1267, the 51st of Henry III. the first positive attempt was made to change the *common weight* into the troy, under the name of the weight of assize; and twenty of the silver pennies then current, being in good condition, so as to counterpoise thirty-two grains of good wheat, were declared to be an ounce."

If the statements made in the preceding pages of this essay be correct, these remarks show that the author of the "Ele-

ments of Pharmacy" was not familiar with the early history of the English weights. In the first place it has been proved that the statute of 1266 provided for the use of the tower or esterling pound, which was one-sixteenth lighter than troy; and the Norman lords understood perfectly well what was meant by it and so did the people. Neither the troy nor avoirdupois weights were intended to be, or were introduced by the provisions of magna charta or the statutes of Henry III. and Edward I. There can be no doubt, however, that the troy weights were introduced under the Norman dynasty. The foreign commerce of England began to flourish in the reign of this same Edward I. and in 1296 two celebrated mercantile societies, one of them natives of Lombardy, had their origin and were incorporated with a special charter of privileges from Edward. According to Hume, these Lombards soon became the goldsmiths and bankers of England; their weight was the troy weight, and by them the probability is that it was introduced. The pound of fifteen ounces or seven thousand and two hundred grains troy weight, may be traced to them also. It was designed to accommodate the weights to the old English rule of two pounds; one of twelve for drugs and gold, and the other of fifteen ounces for all other things. But this pound was never made a legal standard, though it was used in many parts of England under the name of the merchant's weight. Gray complains very heavily of the conduct of the Normans in thus attempting to force upon the nation the weight of Troyes in Champagne as preferable to their own. It certainly is much to be regretted that the old tower or easterling pound was supplanted, and with it all the beauty of the ancient system. But it was brought about by a concurrence of circumstances, over which it appears the Norman kings had as little control as they had over the elements. He inveighs against sir Theodore Turquet De la Mayerne, compiler of the London Pharmacopœia in 1418, for ordering the apothecaries to dispense by troy weight, instead of the avoirdupois which had previously been used in dispensing. Now it is altogether probable that the avoirdupois, as respects England, is of no more ancient date than the troy weight.

This gentleman calls it "the Roman weight, the commonest weight in use, and therefore, without doubt, the most ancient." Of its antiquity there can be no doubt, as I have stated the half ounce avoirdupois to equipoise the Jewish shekel; and therefore, for aught we know, this weight is of antediluvian origin. But its being the commonest weight in use only shows that it has completely supplanted the merchant's pound of fifteen ounces, which corresponded with the twelve ounce tower pound, and was a part of the system of 1266. The practice of dispensing drugs by one weight (a small one) and buying and selling all other merchandize by another (a larger one), we have seen was of more ancient date than the introduction of the troy weight.

In recommending this to the apothecaries, sir Theodore only obeyed the custom of ages, and alluded to the troy weight as the one recognized by law. The avoirdupois weight ought to bear as much blame as the troy, for it was evidently introduced by the Normans, and probably about the same time, under the particular sanction of those same Lombardy merchants, and as a part of their system of metrology.

The first use made of the word "*avoirdupois*" is in a statute of the 9th Edward III. 1335, which is also the first authority for these *merchant strangers* to buy and sell corn, wine, fish, *avoirdupois*, flesh, and all other provisions, victuals, &c.

Eighteen years afterwards (1353), in another statute, the word *avoirdupois* occurs again, applied to merchandize, and complaints are alluded to, that these foreigners bought by one weight and sold by another, that was smaller. The statute therefore says—"We therefore will and establish that one weight, one measure, and one yard be throughout the land," &c.

Now it is manifest that the word *avoirdupois* was originally applied to all weighable articles, (toutz manerz des choses poisablez), the expression of these statutes; and also, that the one weight, one measure, &c. applied to the old merchant's weight of fifteen ounces, between which and the weight of these merchant strangers there was a difference.

The weight of these foreigners was obviously the avoirdupois, corresponding with their troy weight, a part of their system, *none* of which was yet recognized by law. The old pound of fifteen ounces contained six thousand seven hundred and fifty grains troy; the avoirdupois pound seven thousand grains troy. A difference of nearly half an ounce was large enough to induce these foreigners to sell by the small legal weight of England, and buy by their own, the avoirdupois. Taking the lead in mercantile pursuits, these Lombards gradually introduced this weight, and in the 24th of Henry VIII. 1532, a statute directs that beef, pork, mutton and veal, shall be sold by weight "*called haverdupois;*" the very use of which expression, *called* haverdupois, indicates that the term was of recent origin, as descriptive of the weight, and that the weight itself had not long been in general use. Thus the troy weight was first used in 1496, for the composition of the gallon and the bushel, and was afterwards introduced at the mint by Henry VIII. in 1527, supplanting the old tower or easterling pound of twelve ounces. And the avoirdupois, it is equally evident, was brought to England about the same time, by the same merchant adventurers, and was legalized by the same Henry VIII. in 1532, as the commercial weight corresponding to the troy pound.

The tone and temper in which the essay on weights in our third number is written, is far from the true standard of philosophical courtesy. Philosophers are, or ought to be, citizens of the world; their common aim to instruct and benefit mankind; and they should bring their gifts to the altar without a disgusting display of national vanity, much less of national bitterness.

It is difficult to discover the reason for appropriating to drugs a specific weight, or to drugs and bullion the same weight; but it appears to have been a custom of very early times; and as the Normans did not introduce the weights of 1266, we may take it for granted it was not an innovation of theirs. It is lamentably true that, as S. F. Gray observes, a trade in which the utmost precision in weights is usually expected, is actually that which is the most inaccurate in that

respect. It is altogether probable, however, that the twelve ounce pound of the tower, originally, and of troy after its introduction, with their subdivisions, were altogether used in those days by the apothecary, not only in compounding but in selling simple medicines. But the apothecaries of this country now compound by troy, and buy and sell by avoirdupois weight. There is a difference of near ten per cent between these weights, therefore they must estimate in prescriptions that the articles are at cost when they have added ten per cent to the actual price paid for them by avoirdupois weight. But if they retailed articles by the half pound or pound troy, they would be gainers in a larger proportion. By the use of the avoirdupois weight in selling pounds and half pounds, the apothecaries have lost the important feature of the plan as respects their interest, and have, moreover, created the confusion in their shops of having two sets of weights employed on their counters. Whether this departure from the ancient practices and acts of parliament originated in subsequent statutes, or in a gradual assimilation of the apothecaries to the customs of other trades, cannot be very easily determined. The appropriation of a specific weight to medicines is a part of the Spanish metrology, and probably of other countries as well as England and the United States. The small divisions of the avoirdupois weights are not now employed, and the brass sets made for the apothecary are a compound of the two; the troy weights beginning at the lowest division of the series, and terminating at the fourth of an ounce, where the avoirdupois commences and is carried to the pound.

The troy and avoirdupois weights, then, were originally introduced by the Lombards; and the first sanctioned by law in 1496, when it was introduced in the composition of the gallon and bushel. It has been stated that the wine gallon thus made was of two hundred and twenty-four cubic inches in dimensions. It is necessary to state that the confusion of this statute by the use of the troy weights, and the employment of the term penny *sterling* for pennyweight troy,

produced also another wine gallon containing two hundred and thirty-one solid inches. As the gallon of two hundred and twenty-four cubic inches was to hold eight troy pounds of wheat, thirty-two kernels of which weighed a pennyweight troy, every kernel, on the average, was one-sixteenth heavier than that wheat which had been used for the composition of the gallon and bushel of 1266, thirty-two kernels of which were equal to the silver penny sterling, which was one-sixteenth lighter than troy weight. The average kernel being specifically heavier, a pound weight of it occupied less space; on the other hand, the corn of lighter kernel would require a greater number of grains to make up the same weight. The gallon of 1496 was to contain 61,440 kernels, weighing in the aggregate eight pounds troy; and they would fill a space of two hundred and twenty-four cubic inches. To make the same weight, eight pounds troy would take 65,280 kernels of the wheat of 1266; but these 65,280 kernels would fill a space of two hundred and thirty-one cubic inches. The difference between the two was a compound of the increase of numbers, and the diminution of weight. It has also been stated that this statute of 1496 ordered the bushel to *contain* eight gallons of wine, instead of directing it to be made by the *weight* of eight such gallons. This never was made, as it would have contained only 1792 cubic inches, instead of 2146, the size of the Winchester bushel; a measure which has always been regarded as very near the true standard, according to the old laws and long established customs of the people. But by a statute of Henry VIII. 1531, it was ordained that a bushel be made by the principle of the *compositio mensurarum* of 1304. That is to say, that it contain the *weight* of eight gallons of wine. But the gallon used in the composition of this bushel was of 231 cubic inches, and the bushel, to balance, filled with wheat, eight such gallons of wine would be equiponderant to sixty-four avoirdupois pounds, and measure 2256 cubic inches. The eighth part of this measure is the gallon of 282 cubic inches, which was for a long time the

standard ale and corn gallon of England, and is to this day, of the United States.

In the reign of queen Anne, after a law suit between the officers of the customs and an importing merchant respecting the size of the gallon measure, an act was passed, "declaring that any round vessel, commonly called a cylinder, having an even bottom, and being seven inches in diameter throughout, and six inches deep from the top of the inside to the bottom, or any vessel containing 231 cubic inches, and no more, shall be deemed and taken to be a lawful wine gallon."

Thus in the attempts to solve the difficulties that have from time to time occurred in their weights and measures, the successive parliaments of England have multiplied the measures bearing the same name, and have introduced two weights unknown to their ancestors, until every vestige of the beautiful uniformity of proportion has entirely disappeared. By a statute of 1816 the standard gallon, both for liquid and dry goods, was ordered to contain ten pounds of pure water at the temperature of 56½ degrees of Fahrenheit's thermometer, and be of the measure of 276.48 cubic inches. That all measures of capacity be taken from this standard in certain parts, multiples and proportions: viz. a *quart* shall be one-fourth of said gallon; a *pint* the half of such quart; and there shall be two such gallons in a *peck*, and four such pecks in a *bushel*. It further ordains that the standard of weight shall be the pound *avoirdupois:* the same being equal in weight to 27.648 cubic inches of pure water at the temperature of 56½ degrees of Fahrenheit; that all measures of weight shall be taken in parts, multiples or certain proportions of the standard pound avoirdupois, viz. fourteen of such pounds make a stone, &c. and then dividing, each pound to contain sixteen ounces, each ounce sixteen drachms, each drachm three scruples, and each scruple ten grains. By this process the uniformity of proportion is utterly demolished, and the uniformity of identity adopted according to the new French metrology.

One standard measure of capacity is made the unit for all substances thus measured, liquid and dry; and one weight the

unit for all substances estimated by gravity. The proportion of uniformity between the specific gravities of wheat and wine, or wheat and spring water, between the troy and avoirdupois weights, and again between the weights and measures of capacity, make neither part nor lot of the arrangement.

It would have been well for succeeding times, after the troy weight was used in the composition of the gallon, and the avoirdupois as the merchant's weight, if the statute of 1496 had never been misunderstood, and continued down to the present day. These weights are in the proportion to each other of the specific gravity of wheat and spring water.

The wine gallon of 224 cubic inches contained exactly eight pounds avoirdupois of wine. A pint of wine was a pound of wine.

The corn gallon of 272 cubic inches, which corresponded with it, contained eight pounds of wheat. A pint of wheat was a pound of wheat, and the bushel of 2176 inches contained sixty-four pounds avoirdupois of that wheat, thirty-two kernels of which weighed a pennyweight troy.

But under this statute of 1496, two sets of measures, both for wine and wheat, were introduced, and the mode has been explained by which it was accomplished.

These were, the wine gallons of 224 and of 231 inches, the beer or corn gallons of 272 and 282 inches, the bushels of 2176 and of 2256 cubic inches.

The standard measures of Pennsylvania, as used at the custom house of Philadelphia, are the wine gallon of 231, and the beer gallon or half peck of 282 cubic inches; a copper half bushel, containing 1093.1 cubic inches, making the bushel 2186.2 solid inches, and holding of Schuylkill water seventy-eight pounds twelve ounces avoirdupois, and of wheat, thirty-two kernels of which are equal to the pennyweight troy, sixty-six pounds two ounces avoirdupois. The weight is the pound avoirdupois, equal to 7000 grains troy. In the different custom houses of the union this weight falls below in some, and rises above 7000 grains troy in others.

The wine and corn gallons mentioned above are still in the

same proportion to each other as the troy and avoirdupois weights, but neither of them is in any useful proportion to the bushel. The troy and avoirdupois weights are with all the exactness that can be desired standards for each other: and the cubic foot of spring water weighs exactly 1000 ounces avoirdupois, which makes the ton of thirty-two cubic feet measure exactly 2000 pounds avoirdupois in weight.

My apology for the length of this article must be the nature of the subject. It appeared to be impossible to compress it more, without such an abridgement of facts as would destroy the interest and render it obscure. In a future number I shall present a view of the new French system of weights and measures, a system which has challenged the admiration of the world; symmetrically beautiful in all its parts, the offspring of accomplished genius and profound learning, yet, as experience has proved, not perfectly adapted to the nature of man and the physical world.

The system unfolded in these pages originated, probably before the dawn of science, in the rude attempts of the barbarian to supply his own wants. It was gradually perfected as the necessities of society and the light of knowledge increased, and in different nations assumed different forms, though still displaying the same leading principle in all—the uniformity of proportion.

In the British statute of 1266, it was brought to a degree of theoretical and practical perfection that left little to be desired. Six centuries of conflicting and inconsistent legislation have laid it in ruins.

The present system of England bears little or no similitude to that from whose ashes it has sprung. Our own retains more of the traces of antiquity, and in my opinion is not the less useful or beautiful for retaining unimpaired some of its original features.

Selected Articles.

On the Blue Colouring-matter of Lapis Lazuli, and on Artificial Ultramarine. By Dr Fr. W. Schweigger-Seidel.*

The mineral colour known by the name of Ultramarine, esteemed for its beauty and durability, especially in oil-painting, has long been an object of chemical inquiry. The lapis lazuli, from which the colour is obtained by careful washings, is procured from Asia (partly through the East Indies, partly by way of Orenburg), where it is found in Little Bucharia, Thibet, several provinces of China, and Siberia†. It seems to have been known to the Romans under the name of sapphire, as appears from some passages of Pliny‡. But the production of ultramarine seems not to have been invented till the end of the fifteenth century; the name of *Azurrum ultramarinum* (the origin of which is very evident) is said to have been first used in the year 1502 by Camillus Leonarius§. It once formed a considerable article of trade in Italy, where this colour was probably first produced, and even now the greatest quantity, and that of the best quality, comes from there.

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* From the *Jahrbuch der Chemie*, &c. N. R. Band xxii. p. 206.

† This is different from the lazulite or *copper lazure* (Armenian stone) which owing to the similarity of their colour used formerly to be mistaken for it; hauyn seems to be more nearly related to lapis lazuli.

‡ *Hist. Nat.* lib. xxxvii. 38, 39.

§ Leuchs's *Farben-und Färbekunde*, ii. 198.

Whether it be in consequence of a lessened demand, and consequent diminished manufacture since the discovery of prussian blue, and other cheaper blues, or in consequence of a diminished importation of the lazure-stone, that this colour has become so very scarce, this much is certain, that its high price (an ounce of the best quality being said to sell now at from one hundred to two hundred francs*) has greatly limited its use; whilst formerly, especially in the sixteenth century, it was almost wasted by painters, as is proved by many pictures of that period.

The value of the colour naturally led to a desire of producing it artificially. Some assert, that the art was known in the sixteenth century, but kept secret. But this probably implied only the art of obtaining ultramarine of the best quality from the lazure-stone. What are called artificial lazure-stones, for the production of which there are many formulæ†, are in fact artificial pieces of glasses coloured with some metallic oxide (mostly oxide of cobalt), which will of course yield no ultramarine. Indeed the colour of lapis lazuli was generally ascribed, until lately, from the results of chemical analysis, and according to analogy, from a metallic oxide (oxide of cobalt, copper, iron, &c. supposed to be contained in it). Wallerius derives it from silver‡, which, however, has not been found by any modern chemist, and which was probably only believed to be it through a well-known mistake usual in former times. The common opinion, however, was, that the blue colour of the mineral was produced by oxide of copper, until it was shown by Marggraf, that the lazure-stone contained oxide of iron only, and no oxide of copper§. It was his analysis which gave the first explanation of the component parts of this stone; for the ac-

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* Leuchs's *Farben-und Färbekunde*, p. 205. Thénard *Traité de Chimie*, tom. ii (618) p. 210.

† Compare some of them in Leuchs, p. 487.

‡ *System. Mineral.* i. 312.

§ See his Chemical works, vol. i. p. 121—134, and Hochheimer's *Chem. Minéralogie*, vol. i. p. 239—244.

counts of Rinmann and Cronstedt are not sufficiently defined. Klaproth's subsequent analysis* generally confirms the results of that of Marggraf, except that he points out a portion of alumina which the latter overlooked; for the rest, he also inclined to the opinion that the blue colour was produced by the oxide of iron. It was Guyton de Morveau who first drew public attention to a portion of potash contained in the lazure-stone, and which he thought accidental, but considered that it was chiefly the sulphur it contained which, combined with the iron, produced the colouring matter of the stone†. This view, however, was refuted by Clement and Desormes, who proved that the ultramarine contained sulphur, but no iron‡; which conclusion was confirmed by the experiments of R. Phillips, on the methods of ascertaining the degree of purity of the ultramarine§. Clement and Desormes at the same time mentioned a considerable proportion of soda in the ultramarine, which also seemed to contain some potash‖. These two chemists, however, express no opinion as to the cause of the blue

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* See *Beiträge*, &c. vol. i. p. 180—196, and Schweigger's *Journal*, vol. xiii. p. 488. xiv. p. 531. and xli. p. 234. He found silica and alumina, carbonate of lime, sulphate of lime, and oxide of iron.

† Compare Scherer's *Journal* (1800), vol. iv. p. 659, and more at large vol. v. p. 709; also *Ann. de Chimie*, xxxiv. p. 54, and Von Crell's *Chem. Ann.* 1801, p. 467: he notices the following substances as appearing accidentally in various quantities in the lazure-stone,—carbonate and sulphate of lime, and at times even barytes.

‡ Gehlen's *Journ. für Chem. u. Phys.* vol. i. p. 214—221, and *Ann. de Chim.* March 1806, tom. lvii. p. 317—364. Compare also *Journ. des Mines*, xvii. (No. 100) p. 322; and this (Schweigger's) *Journal*, vol. xiii. p. 489; vol. xiv. p. 331, and vol. xli. p. 235.

§ Vol. xli. of this (Schweigger's) *Journal*, p. 233—241. Comp. also Annals of Philosophy, No. 51, July 1823, p. 31. The methods of examination are given here with mountain blue, prussian blue, indigo, smalt, and oxide of cobalt, although we may venture (as Phillips says at p. 239) to declare an ultramarine as genuine, which in a few minutes "(developing sulphurous acid gas, especially on being heated)" loses its colour when an acid is poured on it, leaves an insoluble dirty white residue, and forms a colourless solution.

‖ They at least saw crystals of alum, like Guyton de Morveau. They found no sulphurous acid gas, and even carbonate of lime does not always appear; but always sulphur in connexion with soda, alumina and silica, which therefore must be considered as the essential components of the ultramarine.

colour. Thénard, indeed, does not deny the possibility of a coloured body being produced by the combination of colourless bodies, but adds that the loss of 0·8 per cent, experienced by MM. Clement and Desormes in their analysis, might lead to the supposition that it was just the colouring substance which had escaped them*. Phillips expresses the opinion that the lazure-stone perhaps owes its colour to a peculiar substance *not metallic*, and recommends this part of the subject to the attention of chemists†.

With this difference of views on the nature of the colouring-matter in the lazure-stone, scarcely any result could be expected from the experiments instituted for producing ultramarine artificially; indeed they were all unavailing. An interesting accident, however, had led to a probable hope of the result ultimately turning out advantageously. M. Tassaërt, superintendent of a manufactory of sulphuric acid and soda, found, on breaking up the hearth of one of his smelting furnaces for soda, in the foundation of it, a blue substance which as long as the hearth had been built of brick, and not of sandstone as it was then, he had never noticed‡. Vauquelin on examining this substance found it greatly to resemble the lazure-stone, and the analysis also indicated alumina and silica united with soda and sulphite of lime, but at the same time with iron and sulphuretted hydrogen, from which latter components, in connexion with alkali, Vauquelin felt inclined to deduce the blue colour of this substance as well as of the lapis lazuli§.

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* See his *Traité de Chimie*, 1e A. tom. ii. p. 208; and Schweigger's *Journal*, vol. xli. p. 236.

† In this (Schweigger's) *Journal*, vol. xli. p. 239.

‡ According to a verbal communication of Dr Weissner, the administrator Herrman at Schönebeck had made a similar discovery some years ago, and declared the substance to be an ultramarine produced by a chemical process. Perhaps we ought also to add to this the blue colouring-matter which at times dyes the calcined potash a beautiful lazure blue, and which has been usually attributed to metallic oxides or finely divided carbon.

§ Compare this (Schweigger's) *Journal*, vol. xiii. Old Series, p. 486, &c. and vol. xiv. p. 333. *Ann. de Chim.* tom. lxxxix. p. 88. Thenard, tom. ii. p. 748. Fechner, ii. p. 418.

Soon after L. Gmelin examined a volcanic product thrown out by Vesuvius, which Breislak (in his *Voyages dans la Campanie*) mentions as a seventh kind of lazulite, and which was afterwards classed by Bruun Neergard with the hauyn*. Nevertheless this mineral seemed to agree in its external characters more with the lapis lazuli than with the hauyn, which induced L. Gmelin to repeat the analysis of lapis lazuli at the same time, and to compare the results of these analyses with those he had recently obtained from the chemical investigation of the hauyn†. The result was, that the blue volcanic product above mentioned had in reality a great similarity with the lazure-stone even in its chemical composition. But the same observation was also applicable to the hauyn, which seemed to differ from the lazure-stone, essentially, only by a proportionately great quantity of sulphuric acid, and by its containing potash instead of the soda found in the lazure-stone. The latter, however, was also the case in the blue volcanic mineral, by which the latter seemed again more closely related to the hauyn than to the lapis lazuli, or at least to form an intermediate link between the two minerals. This induced L. Gmelin to arrange the lazuli, containing soda, with the hauyn, containing potash, as species or subspecies nearly allied, but to consider the blue mineral, under the name of *earthy hauyn*, as a mere variety of the common, called *granular hauyn*. In other respects the volcanic product differs from the two other substances by containing a considerable proportion of iron: L. Gmelin, however, also found iron in the lazuli, and he would not have been disinclined to take the colouring principle for protosulphuret of iron, had not Clement and Desormes shown that there is no iron in the ultramarine.

Almost at the time when Vauquelin's and Gmelin's investigations of substances resembling lazulite‡ (which evidently

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* *Journ des Mines*, No. 125.

† *Observationes Geognosticæ et Chemicæ de Hauynâ*, &c.

‡ See this (Schweigger's) *Journal*, vol. xiv. Old Series, p. 325—335, where at p. 331 a tabular view is given of the analyses here alluded to. Let it also be

were indebted for their existence to chemical processes nearly related,) raised the possibility of an artificial production of ultramarine almost to a certainty, without, however, giving any clear explanations respecting it, another German chemist (who has not only enriched the science in so distinguished a manner, but also the arts by a number of ingenious investigations) found in quite a different way an indication of the colouring-matter in the lazuli, and he would have required but little further investigation to become perfect master of the artificial production of ultramarine.

By the communication of some experiments on the fuming sulphuric acid, which were published in the year 1815 in this (Schweigger's) journal*, Dœbereiner developed his views on the composition of sulphur, as consisting of hydrogen and a probably metallic body (*schwefelstoff*,) whence he felt inclined to deduce the blue colour of Vogel's blue sulphuric acid. "And if," concluded this able chemist, "the colour of the pure sulphureous substance is really blue, the colour of the ultramarine seems to be solely produced by this substance; and that from potash or soda, sulphur, silica and alumina, under certain conditions, a blue similar to the ultramarine, only less brilliant and beautifully clear, may be produced, I have shown a year ago to Professors Gehlen and Schweigger. I have been withdrawn from this investigation by other occupations, but shall soon again devote myself to it, and communicate the results." He, then, was the chemist who for the first time pronounced the colouring principle of ultramarine to be sulphur.

Unfortunately Dœbereiner has not again pursued his beautiful discovery: it is therefore the more satisfactory that the fact is now confirmed in many journals, with the intelligence which, no doubt, will please the practical chemists, that another of our most distinguished German chemists, Professor C. G. Gmelin of Tubingen, has succeeded in the discovery of a proper chemical process for the production of ultramarine.

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observed that Gmelin found traces of potash besides the soda in the lazuli, and 2 per cent of magnesia.

* Vol. xiii. Old Series, p. 476—484.

We cannot conclude this review more suitably than by a verbal transcript of the following account from the *Berliner Hand und Spener'sche Zeitung*, (10th April 1828,) No. 84, and which in substance seems to be from the distinguished inventor himself.

"*Tubingen.*—Prof. C. G. Gmelin, who for some time past has been employed in the investigation of ultramarine, has arrived at the conviction that sulphur is its colouring principle, and particularly that there is no metal, properly so called, entering into its composition. Gmelin had received some ultramarine from Paris eighteen months ago, but which, according to the opinion of M. Seybold, the artist at Stuttgard, was not of the best quality. In order, therefore, to obtain ultramarine of all kinds, and to determine by strict analysis what proportions of its component parts are most favourable to the production of its fiery colour, he addressed himself months ago to Prof. Carpi at Rome. During a short residence he made in Paris, in the spring of 1827, he expressed it as his opinion to the chemists of that metropolis, especially to M. Gay-Lussac, that ultramarine, with the investigation of which he told them he was then engaged, might be produced artificially. It is perhaps, therefore, his own fault if another (M. Tunel of Paris, who wishes to keep his discovery a secret) has anticipated him in this respect. The process by which, according to M. G.'s inquiries, the production of ultramarine is always successful, is the following:—Procure silica containing water and alumina; calculate how much a given weight of these earths will leave after being calcined. (By Gmelin's investigations 100 parts of hydrous silica contained only 56, and 100 parts of hydrous alumina only 32·4 parts of pure earth.) Next, dissolve as much of the hydrous silica as can be dissolved in caustic soda, and calculate the quantity of earth used. Add now to 72 parts of this silica (calculated as free from water) 70 parts of alumina (also calculated in a state free from water); add the latter to the silicate of soda, and let it evaporate, stirring it all the time till the residue presents a damp powder. (One may also take at

once 60 parts of dry caustic soda to 72 parts of alumina obtained from alum, the latter being reduced to the dry state.) This colourless mixture of silica, soda, and alumina, is the foundation of the ultramarine, which is to receive its blue colour. For this purpose, melt in an earthen crucible, well closed, a mixture of two parts of sulphur and one part of anhydrous carbonate of soda, and when the mass is properly melted, throw very small portions of the first mixture at once into the middle of the crucible: as soon as the effervescence produced by the rising of the aqueous vapours has ceased, throw in another portion, and so on; and keep the crucible, when the whole mixture has been introduced, for about one hour in a moderate red glowing heat (if the heat is too great, it destroys the colour); when cold, pour water into the crucible, and separate by means of it the brown residue of sulphur mixed with the ultramarine. A superabundance of sulphur may be expelled by a moderate heating. If the colouring is not of an equal intensity, the most fiery ultramarine (and this is a very important circumstance) may be obtained by washing, and separating it from those parts which are less coloured. From the component parts of the ultramarine as given by the analysis, it cannot be formed, without a medium. Thus this colour is nothing else than a silicate of soda dyed with sulphuret of sodium.

"The natural ultramarine contains a not inconsiderable portion of potash and sulphuric acid; and it is very probable that the artificial production here mentioned may be usefully varied, but this can only be discovered by experiment."

Observations and Experiments upon the Kusia or Koosia of the Indians,—the Bitter Cucumber, Momordica operculata of Linnæus. By John Hancock, M.D.

This plant, the fruit of which forms, perhaps, the most active hydragogue purgative in nature, is indigenous upon the sandy shores of the Essequebo and in various parts of the interior of Guiana; yet it had never been known as a remedy, nor at all noticed in the colony, so far as I am aware, till the year 1821, when, from its extraordinary bitterness and analogy to momordica, I was induced to make trial of it medicinally. Since that period I have employed it with the most satisfactory results, more especially in general dropsy, leucophlegmasia, mal d'estomac, cachexy, and weakened sluggish state of the organs of digestion.

The plant is a scandent vine, having altogether the *habit* and *facies* of the *Cucumis sativa* or common edible cucumber. In the Linnæan system it belongs to the *Monoecia Monadelphia*, natural order *Cucurbitaceæ*.

The root is fibrous. The stem is five-angled, five-channeled, climbing to the summit of the highest trees, or trailing extensively over the surface of the ground. The leaves are distant, angular, obscurely five-lobed, roughly pubescent, on long channeled petioles. The tendrils at the base of the petioles are long, divided and spiral. The flowers are yellow, the males borne in clusters upon a long common receptacle; the females solitary, elevated above the germ upon a stout columnar receptacle, which grows and becomes the lid or operculum of the capsule. The petals of the corolla, in both males and females, are about thrice the length of the calyx, obovate, spreading, obtuse. In the males, both the calyx and corolla are deeply cleft, or joined at the base only. In the female calyx, there are five acute leaflets, which are quite distinct and distant. In all these respects, its disparity with the assigned characters of *elaterium* or *momordica* will be apparent. The antheræ, as in most of the kindred genera in this natural

order, are five in number, cohering, borne upon three filaments. The stile is cleft. The germ large, angular, swelling into an oval, trilocular, prickly, brown and dry *capsule*, rather than a *pepo* or *pomum*, as stated in botanical works.* Willdenow therefore says of the fruit "intus absque pulpa, siccus." The fruit, indeed, appears, in respect to its envelope, almost as much the capsule, as in *Papaver*, *Bixa*, or *Sparmannia*, and, like the former, sheds its seeds at the insertion of the pistillum. This is mentioned merely to show a similarity in respect to the external pericarp, and for no further analogy. The lid falling, discovers within a white three-celled reticulum or web-like substance, lying loose, or but slightly attached to its envelope. This web† is exceedingly bitter, and one of the most active cathartics in nature. It forms the true receptaculum of the seeds, which are black, compressed, and numerous. The albumen is pregnant with a sweet bland oil. Willdenow says the fruit is green, "fructus viridis," &c. Like most other fruits, it has a green colour before maturity: it then rapidly turns brown and dry.

It would seem that the locality or habitat of this plant had never been known or defined; for Linnæus, and all the later botanists, have, after Commelin, referred it to America, which is a wide field for research, if a botanist wished to identify the plant, as they do not point out any particular part of that vast continent where the plant is to be found. In fact, the little that is known of it, appears to rest solely on the authority of Commelin, who has given the figure of the plant,‡ if it be the same species.

The words of Commelin are, "Mom. Americana, fructu re-

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* In the whole order the fruit is a pepo, but this becomes dry and fibrous in several *when ripe*.

† I call it a web for brevity, and it seems to me the most expressive term I can find for it; the fruit being neither a cucumber, an apple, nor a gourd, but a capsule enclosing a light web or reticulum.

‡ V. Plantæ. rar. Commelini, T. 22. Possibly, however, it may be growing in some of the botanical gardens here, as seeds of the plant were sent to Scotland a few years since from Essequebo.

ticulato sicco. Ex fibrosa et parva radice, sarmenta proveniunt tenuia, viridia et *rotunda.*" In his figure also, it appears as a round stem. Of the embryo, he observes, "Qui tandem excrescit oblongum, turbinatum et echinatum: hic per maturitatem fungosus et retis instar perforatus est, in quo semina continentur, oblonga, plana et nigricantia." In a section of the ripe fruit, the web or reticulum is represented as having six lobes and six corresponding cells, and is apparently sprinkled with black dots.*

The Kusia, however, has usually only three cells, most rarely four, but never exceeds that number. The stem, instead of being round, has five acute angles. Besides, our author has neither figured, or made any allusion to the operculum, which constitutes its most singular and striking character. It appears to me, therefore, not improbable that we have two distinct species confounded under the same names of *Momordica operculata;* but this we cannot decide, being uncertain whether Commelin's description be correct.

For the plant here described, the native name Kusia or *Koosia* as a trivial one may be most convenient, the Linnæan (if it be *M. ὁper.?*) being too long, I had almost said too barbarous, for frequent repetition. Knowing no English name, I had called it Bitter Cucumber; but this name is appropriated to the *Cucumis agrestis* of Linnæus; besides, the *Koosia* is neither properly a pepo nor pomum, but a dry trilocular capsule, not bursting, but having a deciduous lid at the apex. In

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* The Cucurbitaceæ have all a three-celled pepo, but several have the appearance of six cells from the alternate position of septa and several receptacles. See this structure well illustrated in Dr Hamilton's paper, Trans. R. Soc. Ed. Vol. xi. part i. which see.

In respect to the fruit of the Cucurbitaceæ, authors, we find, differ much as to the structure observable in the several genera; but it certainly does differ greatly in this natural order. Authors represent those of the genus *cucurbita* to be a pepo with from three to five or six cells. *Sicyos*, monospermous; in *Bryonia*, a berry; in the genus *Elaterium* a *capsule unilocularis*, 2 ad 3 valvis, Decandolle; in *Erythropelum* of Blum. *unilocularis, trivalvis.* Cucurbitaceæ 1 *S. multilocularis*, Persoon. *trichosanthes* 1? 3-9 *locularis* Decandolle, Prodrom. pars. iii.

this respect it differs widely from *M. Elaterium*, which is a succulent cucumber bursting at the base, and ejecting its juice and seeds in a peculiar manner. *M. cylindrica* has also a dry capsule, and I believe several of this genus have the same, whilst other species bear juicy, spongy cucumbers, more or less like elaterium. I expect that the modern revolutionizing botanists have in many instances parted genera on much slighter grounds of difference than are observable in the genus *momordica*.

The web or reticulum of the fruit, which usually weighs about six or eight grains, is the active part. The seeds and the outer shell or capsule are inert; yet, as somewhat of the active part may adhere to the seeds and shell, I have generally employed the whole fruit.

I have paid no attention to the chemical affinities of this substance. On cutting the green fruit, I have observed that it blackens the knife, from which I judge that it contains much gallic acid. If there be such a thing as a *bitter principle*, this assuredly presents it, for it is one of the bitterest of known substances. In this respect, the quassia bears no comparison with it. The web, agitated in water, gives out much froth like soap.

As to its *modus operandi*, I may observe, that, whilst it evacuates the intestines, it unloads the cellular system of serous deposit, unburdens and accelerates the circulation, has much effect in glandular and visceral obstructions, in improving digestion and rousing the alimentary functions. This no doubt is partly owing to its potent bitterness, for we find the infusion very bitter, although in the proportion only of one grain of the decorticated portion or web (which is a common dose) to a tumbler full of water.

For the first two or three years I used the koosia alone, or without any other adjunct; but, finding the infusion, which seemed in some respects preferable to the tincture, to spoil very soon, I entered upon a long series of experiments for finding a preservative which should at the same time moderate its actions upon the stomach, as being liable to promote vomit-

ing. After trying various acids, alkalies, oils, sugar, neutral salts, &c. I could find no advantage was gained, excepting in the combination with common salt or cream of tartar, by either of which adjuncts the infusion would not only keep for many months, but its operation was considerably milder on the stomach, and with more certainty directed to the bowels, so, indeed, as very materially to improve the remedy, seldom causing vomiting in the common dose (one grain) unless the stomach be foul.

In this way, two of the capsules put into a quart or porter bottle, with a tablespoonful of common salt, half filled with boiling water, shaken several times, and afterwards filled up with boiling water to the neck, and agitated several times while cooling, will make an infusion, of which from half a wine-glass to a glassful, or from one to two ounces, may be taken for a dose, according to the patient's strength and habit of body. If the fruit should be deteriorated by age or moisture, a larger dose may be required, which in this form will be easily ascertained by trial.

It may be prepared in the same manner with the supertartrate of potash; but, as a larger portion of water is required to dissolve this salt, I have usually prepared it with four times the quantity of water, and, consequently, a quadruple dose of this was given.

The first of these preparations is the most convenient and equal in all respects to the second, as an ordinary purgative; but, in dropsical cases, the second (*i. e.* with super. of potash) may be preferable. With either, however, patients express their astonishment at the quantity of water carried off by stool, even when they have drank nothing for the whole day, or for the preceding twenty-four hours. It is not a little amusing to hear the negroes discussing this subject at times among themselves. I have heard them remark, that the water was sucked up out of all their skin—by all the skin meaning the whole body. Notwithstanding its extreme bitterness and the nausea it will often occasion, I have observed them fond of taking it in many cases, as, when they are really ill, they esteem a

medicine the more highly when it *works them off well, as they call it.* When not so, any thing will do as a placebo.

With an additional teaspoonful or two to the dose of cream of tartar in either of the foregoing preparations, it forms a most potent hydragogue cathartic, diuretic and sudorific, especially if taken warm. In smaller doses it is a very capital alterative and stomachic. Its use, whether in full or alterative doses, is usually followed by much increase of the appetite. The patient should be covered warm, and lie still in bed. It usually acts with much effect on the skin, bowels, and kidneys; in short, on the whole system. For delicate stomachs, the addition of liquorice renders it much less offensive.

I have always found it best to give this remedy at one draught as a cathartic; for, according to my experience, it does not act well in divided doses, as directed with elaterium; and, notwithstanding its activity, there is nothing to be feared from a full dose, for, should the evacuation prove excessive or harassing to the patient, it is immediately controllable by a small dose of opium, with the use of barley-water, starch glysters, with tincture of opium if required. This I have proved from trials made on purpose, for I never had actual occasion for it. In the fluid form, in which it is exhibited, it is certain of being rejected when taken in an over-dose; and, if the extract of elaterium were or could be given in this way by infusion, it is probable that purgative would seldom be found to operate with too great violence, as often reported of it.

When a full dose of the bitter infusion is taken, the patient should lie down and remain tranquil for an hour or two, in order to prevent vomiting, and should be provided with a flat basin to enable him to spit without raising his head and shoulders, by which means he will, in a great measure, avoid the disagreeable nausea which is apt to attend the medicine. With this precaution it will seldom cause vomiting. Although exciting, however, no sensible nausea, it will augment the flow of saliva, and indeed it appears to promote the secretion of mucus or slimy fluids in the alimentary canal along its whole course.

I have commonly repeated the dose in ascites after three or four days, according to the strength of the patient, and have also given it in universal dropsy with complete success, even in the most forlorn cases. It should be commenced early, however, to give it a fair chance of success. In the advanced stage more caution is requisite.

I must here observe, that, when it is not early perceived to produce favourable effects, as reducing dropsical swellings, &c. I have usually found a gentle mercurial course to be attended with the most decided advantage, and that, both by its own proper agency, and as a preparatory, or as reducing the system of the patient to a condition susceptible of the action of other remedies.

I am aware that mercury is often employed by practitioners in dropsy, but upon too limited and narrow views, being restricted, by a capricious dogma, to those cases only which appear to depend on a diseased state of the liver. Many who have observed the efficacy of mercury in dropsy, who have a servile deference for fashionable though often absurd maxims of pathologists, and who shape their practice upon what they conceive established and unerring principles, may be observed racking their brains to make out some affection of the liver, so as to get a plea for prescribing mercury; the oracles have taught them that mercury is to be resorted to in dropsy, only when the functions of the liver are disordered; and thus is the healing art fettered, in thousands of instances, by the dogmas of physic.

According to my experience, there is no tribe of diseases in which mercury, under proper management, is more generally advantageous than in dropsies; but it appears to me to be equally so whether the liver be diseased or not. In some cases I have found it necessary to repeat salivation, and even to employ paracentesis withal.

In a most obstinate case of ascites and general dropsy, which occurred about two years since in a black woman, (Frankey,) on plantation Better Success, Essequebo, I found it requisite to draw off the water by tapping eight or nine dif-

ferent times, and to salivate her thrice. When I left the coast, she had been several months at her work, hale and strong, without the smallest symptom indicative of a relapse. In this case the kusia held only a subordinate place in the cure; and this case is cited rather as an instance of the failure of the remedy singly employed, and to indicate the additional means which were resorted to with complete success. Decoctions of the bark of *Amyris Juribali* and ginger were also given to restore the strength during and somewhat prior to convalescence. The kusia alone, however, has often effected cures in the most forlorn cases of general dropsy.

Its effects by glysters, in procuring operation in dry belly-ache, exceed any thing I have yet tried. It causes some sickness at the stomach at times, but less than when taken by the mouth; yet it appears to empty the whole canal, attended, perhaps, with a less secretion of water.

I have also employed it by enema with happy results, in two cases of enlargement of the spleen, one of which was in my own person about three years since. This swelling arose during the progress of an ardent fever, which was succeeded by an intermittent; and both the fever and painful swelling were removed by four or five enemas of kusia.

To prevent its too ready action on the lower intestines, the injection should be very dilute, as one web to a quart of water, of which from four to six ounces may be injected, and repeated as may be requisite. A little soap and sweet oil is a useful addition as emollient and sheathing. In this mode, employing it cautiously, in small quantities, and at distant intervals, I am disposed to think it may prove a potent resolvent in cases of obstruction and enlargement of the spleen, perhaps of the liver and other viscera, prepared as already noticed.

In 1825, I gave some of the fruit of the kusia to Drs Robson and Allen, who effected several cures of dropsy with it in Demerara; and they several times sent for further supplies. Dr Robson, who has come home to settle in Scarborough, can give his own account of it. This is the only reference I can make to any medical testimony on the subject. Being, how-

ever, so abundant that cart loads of it could soon be collected in Essequebo in the months of March, April, and May, experiments with it may easily be instituted on a large scale, as in hospitals especially.

I may conclude with a few remarks on the officinal elaterium. I had some samples of it sent out to Demerara, which were all widely different in power, some being almost inert. This I thought arose from the strange mode directed for their preparation. The active principle in kusia is soluble both in water and spirit: it would seem not to be so in elaterium, if we may draw an inference from the mode of preparation directed by the colleges. That of the Edinburgh college seems to me quite unintelligible.* If the active part be at all soluble in aqueous menstrua, then a large portion must be lost, *i. e.* thrown away in the supernatant liquor or juice, besides what must remain in the pulp when but slightly pressed. Hence the minute portion of extract obtained and its extravagant price.†

"From Dr Clutterbuck's experiments, it appears that the quantity of elaterium is so small that only six grains of it are procured from forty cucumbers. Dr Paris found that ten grains of the best elaterium, as it is found in the shops, contains only one grain of elatine; and he observes, that in general it is adulterated with starch, on which account we scarcely ever obtain two samples of it of the same strength."—L. C. p. 765.

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* This, however, it appears from an observation of Dr Thompson, is now abolished: "It is very remarkable that the Edinburgh college has rejected so important a remedy from the last edition of its Pharmacopœia." London Dispensatory, p. 766.

† From a subsequent consideration of the subject, it appears that the active principle in elaterium is not soluble in water, as in some pharmacopœias, (as that of Van Mons. &c.) the fecula is directed to be washed, *well washed* in water, by which it plainly appears neither to be soluble in simple water nor its own proper juice. This insolubility in water indicates its resinous nature, which may in some measure account for its acrimony and drastic operation on the bowels; on the contrary, the active principle in kusia being soluble in water, may account for its greater mildness of operation.

The fructus kusia has the advantage of uniformity in point of strength and activity, if gathered about its maturity, and kept from moisture, and it admits of no adulteration. Each web containing on an average about seven grains or seven full cathartic doses, presents a great contrast with that just cited of elaterium.

It may here be observed, that the common *extractum elaterii* of the shops, so variable and uncertain in power, is in general, however, found to act in a dose of from half a grain to two grains, *i. e.* in about the same quantity as the *web* of kusia by infusion. An ounce of the extract will cost in the shops about £3 sterling, according to Mr Gray's Supplement to the Pharmacopœias. The web of kusia need not cost more, I should suppose, than 4*d.* or 6*d.* the ounce, containing at least an equal number of doses. This may be considered a great advantage to the poor, although it may be said they stand more in need of food than physic.

The elaterium of the shops, indeed, from the roughness and extreme uncertainty in its operation, has by many, and perhaps with reason, been considered a medicine not unattended with danger.—*Edin. Med. and Surg. Jour.*

Review.

Traité des Moyens de reconnaitre les Falsifications des Drogues Simples et Composées, et d'en constater le Degré de Pureté. Par A. Bussy et A. F. Boutron-Charlard. Paris, 1829. *Pp.* 506, 8*vo.*

This is a work of great interest and research, and we propose accordingly to present our readers with a copious analysis of its contents. The authors state, that owing to the political circumstances by which France has, at different eras, been isolated from other countries, frauds and sophistications of drugs are more common there than in any other country. "It was particularly," say they, "during the wars of the republic, and the establishment of the continental system, that the arts of sophistication were cultivated. The French ports being shut against foreign merchandise, the imperial government thought itself bound to encourage the use of succedanea: books were written to make known to France her own riches in this respect; and whether from enthusiasm or novelty, most of the productions of the Indies were soon replaced by articles of French growth. The most precious virtues were ascribed to substances until then regarded as worthless. The bark of the horse chesnut, the rhubarb of Morbihan, the poppy and the woad of our southern departments, were proposed as substitutes for the cinchona of Peru, the rhubarb of China, the opium of the Levant, and the indigo of Bengal.

We then saw Marseilles transformed into a great workshop of frauds; gum resins, resins, balsams, manna, castor, opium,

musk, were no longer any thing more than clumsy sophistications, which, if they did not exercise a fatal action on the animal economy, were at least inert. "Although since that period political events have restored the freedom of trade, and re-established our communications with foreign powers, the sophistications have survived the prohibitive system which fostered them, and have even received a new impulse from the progress of modern chemistry; a progress which has been seized to profit by these falsificators, and has rendered it more difficult to detect their frauds."

The increasing commerce in drugs with France renders a knowledge of these sophistications important to our countrymen; and we shall therefore prepare an abstract of such passages as appear to us interesting, without much further comment. We shall only observe that the work is not a mere account of sophistications, but is replete with practical information respecting the qualities and properties of medicinal substances.

Acetic acid.—A curious property of this acid may lead to a great error in estimating its strength.

The purest acid that has hitherto been obtained contains an eighth part of water. In this state it is solid at 60° Fahrenheit, and its specific gravity is 1·063. By adding water until it forms a third part of the pure acid, the specific gravity is increased to 1.079. An additional quantity of water reduces the specific gravity, so that we cannot trust to the hydrometer alone in estimating the strength of strong acetic acid.

Acid benzoic.—This acid is in its purest state when obtained by subliming the crystals formed by Scheele's process. It must be remarked that the acid obtained by sublimation from the benzoin is supposed to derive some of its medicinal virtues from the empyreumatic oil it contains. In subliming Scheele's acid we obtain but about one half the quantity employed.

Benzoic acid is obtained from the urine of herbivorous animals, in which it exists in the state of benzoate of soda. It presents itself in the form of beautiful white plates, which betray a urinous odour—and should always be rejected.

Acid citric.—This acid is sometimes mixed with large crystals of tartaric and oxalic acids. The experienced eye will always recognize these admixtures, which are readily detected by the precipitate which they form with a concentrated solution of hydrochlorate of potassa. A deposition of granular crystals and bitartrate or binoxalate of potassa is thrown down when these acids are present, while the pure citric acid does not trouble the transparency of the solution. Where a dilute solution of suspected acid is submitted to examination, dry acetate of potassa may be substituted to advantage for the hydrochloric solution.

Acid hydrochloric.—The density of this acid is sometimes increased by the addition of salts, the presence of which may always be known by evaporation.

Sulphuric acid may be readily recognized by the addition of baryta water, which forms with it a perfectly insoluble precipitate. Sulphurous acid is a more common adulteration, and is always present when the fire is pushed too far at the close of the distillation. It communicates a peculiar penetrating odour to the muriatic acid, which may easily be recognized. In order to discover it, saturate the suspected acid with baryta water, and treat the washed precipitate with sulphuric acid, when fumes of sulphurous acid will speedily manifest its presence.

The presence of iron may readily be known by the addition of a few drops of the solution of ferro-hydro-cyanate of potassa. The yellow colour of hydrochloric acid is not a sure indication of the presence of iron; but is sometimes caused by the presence of iodine or bromine. To ascertain the strength of this acid, dilute a given weight of it with two or three times its weight of water, and ascertain the quantity of carbonate of lime (powdered marble) which it will saturate. Multiply this quantity by 0.74, and we shall have the quantity of real acid employed.

Acid hydrocyanic.—The process of Vauquelin, who decomposes a solution of one part of cyanide of mercury in eight

parts of water by a hydrosulphuric acid, is recommended as the most uniform preparation in regard to strength.

Table of the Density of Various Mixtures of Water and Hydrocyanic Acid.

Hydrocyanic Acid	Water	Sp. Gr.
1	0	0·70583
1	1	0·90355
1	2	0.91608
1	4	0·97825
1	5	0·99679
1	9	0·99807

Nitric acid.—To ascertain its strength neutralize with powdered marble, and multiply the quantity of marble requisite for this purpose by 1·08.

Acid sulphuric.—Nitric and nitrous acid cannot exist in concentrated sulphuric acid, unless added after concentration for the purpose of whitening the acid; for they would be driven off by the heat necessary to concentrate it. They may always be discovered by heating that acid.

Sulphate of lead may be detected by a solution of hydrosulphate of ammonia.

Ammonia.—The presence of empyreumatic oil may be detected by slowly mixing with a great excess of sulphuric acid, which will blacken it. Hydrochlorate of ammonia sometimes comes over in preparing ammonia. To discover it, saturate with nitric acid, and add nitrate of silver. The presence of sulphuric acid may be discovered by saturating with nitric acid and adding baryta water.

Angustura bark.—The true Angustura bark has an animalized odour. "There are parcels of true Angustura in which this odour is slight; but we have met with others in which the smell was so decided that it resembled that of fish."

Reagents.	Aqueous Infusion of true Angustura Bark.	Aqueous Infusion of false Angustura Bark.
Tincture of litmus.	Colour destroyed.	Little or no change.
Sulphate of iron.	Abundant light gray precipitate.	Slightly turbid bottle green colour.
Hydro-ferrocyanate of potassa.	No precipitate at first. Hydrochloric acid forms at length a very abundant yellow precipitate.	Slightly turbid. Hydrochloric acid does not increase the precipitate; the whole assumes a greenish hue.
Caustic potassa.	With a great or small quantity the liquid deepens into an orange with a greenish hue and precipitates. Nitric acid restores the original colour.	A small quantity gives a bottle green colour, a larger quantity a deep orange with a greenish hue. The liquor remains transparent. Nitric acid added slowly restores the green colour, and finally that of the infusion.

In addition to these characters it may be added, that a drop of nitric acid on the internal surface of the false Angustura forms, after two or three minutes, a deep blood-red spot, caused by the brucine. A drop of the same acid placed on the external surface of the lichens which cover the bark, becomes of a deep emerald green. Neither of which happens to the true Angustura.

Minutes of the College.

At a meeting of the Philadelphia College of Pharmacy, held December 8th, 1829, it was resolved that the President and Secretary be directed to arrange and digest the Laws of the College as they now exist.

January 26, 1830. The following communication was read from the corresponding secretary:

To the Philadelphia College of Pharmacy.

GENTLEMEN:—As corresponding secretary of the College of Pharmacy, I have to perform the painful duty of announcing to you the death of M. Vauquelin, a foreign honorary member of this institution. The loss of this great chemist, who contributed so eminently to the advancement of chemistry, will be deeply felt by the lovers of this science. He died in the course of last November, of a severe and lingering disease. He was director of the Parisian School of Pharmacy, Professor of Chemistry at the Royal Garden, Member of the French Academies of Science and Medicine, and of the Royal Society of London, &c.

Your's, most respectfully,

E. DURAND.

A report from the President and Secretary, appointed in December to arrange and digest the Laws of the College, was read; and, with some amendments, was adopted.

The following gentlemen, proposed at a former meeting, were duly elected foreign members of the college.

M. Brandes, Director of the Pharmaceutical Society of Northern Germany, Salzuffen in Lippe Detmold, Westphalia.

M. Doebereiner, Professor of Chemistry and Pharmacy in the University of Jena.

M. Sertuerner, Apothecary in Hamlin, Hanover.

M. Tromsdorff, Apothecary, and Professor of Pharmacy, Erfurt, Prussia.

M. Hermbstedt, Professor of Pharmacy in the University of Berlin, Prussia.

March 30th. The Publication Committee made their annual report for the past year, which was read and accepted.

A report from the Treasurer was read, accompanied by an account current for the past year, and referred for examination to a committee.

The College next proceeded to the annual election, when the following gentlemen were duly chosen.

President,—Daniel B. Smith.

Vice Presidents,—Samuel Jackson, M.D., Henry Troth.

Secretary,—Charles Ellis.

Treasurer,—Edward B. Garrigues.

Trustees,—Alexander Fullerton, Jun. Warder Morris, Peter Lehman, Charles H. Dingee, Samuel C. Sheppard, Joseph Reakirt, John Carter, William Marriott.

Trustees elected in September last,—Benjamin Ellis, M.D. Algernon S. Roberts, Charles Schaffer, Jun. Samuel P. Griffitts, Jun. John Price Wetherill, Samuel F. Troth, George B. Wood, M.D. William Hodgson, Jun.

Publication Committee,—Benjamin Ellis, M.D. George B. Wood, M.D., Daniel B. Smith, Charles Ellis, Samuel P. Griffitts, Jun.

Miscellany.

Non-existence of Chinoidine.—In the fourth number of our first volume, we published a short account of some new alkaloids, reputed to have been discovered in cinchona bark by the celebrated German chemist Sertuerner. We find in the Journal de Pharmacie for March 1830, an account of some researches made by MM. Henry, fils, and Auguste de Delondre in order to separate and identify these interesting substances.

These gentlemen state, that previously to the publication of Dr Sertuerner's discovery, they were endeavouring to ascertain the causes which prevented the crystallization of the last portions of the mother-waters in the manufacture of sulphate of quinia.

These new alkaloids (of which *chinioidia* was the principal) were represented by their discoverer to bear the same relation to quinia and cinchonia that narcotine bears to morphia in the native compound. The French chemists were stimulated therefore to prosecute their inquiries with zeal, as this discovery appeared to solve their difficulty, and present, in an insulated form, a substance hitherto found inseparable and intractable. But instead of a new alkaloid, they only recognized quinia and cinchonia, united with yellow resinous matters, which prevented the crystallization, and which they separated more or less completely by several processes, following as closely as possible the means pointed out by Sertuerner in the short account he published of his experiments. From these experiments, five in number, and doubtless conducted with every attention to exactness, these distinguished chemists conclude—

1. That there is no doubt of the non-existence of *chinioidine*, and that it is nothing more than a modification of quinia and cinchonia united and rendered uncrystallizable by a peculiar yellow matter. These modifications cease when, after much time and care, they were able to separate or destroy it, and cause the alkalies to crystallize.

2. That the yellow resinous matter which accompanies quinia much more than the cinchonia, appears greatly to change their properties. They separated this substance, but were unable to collect it again by itself, at least very imperfectly; but it appears to differ materially from the yellow colouring matter of cinchona, which is fixed by alumine and oxides of lead and tin.

3. That it is especially on the crystallizations that it exerts the most influence.

4. And that the most certain means of depriving the mother-waters of it are by the addition of turpentine, precipitation and solution in acids frequently repeated; finally, concentration and cold.

Animal Charcoal as a Remedy in Glandular Affections.—Some of the German physicians, particularly Drs Weise, Wagner and Gumpert de Posen, have employed this substance with some success in glandular and schirrhous affections. From the results of their trials, these gentlemen are induced to consider animal charcoal as possessing the *resolvent* powers of iodine and mercury, without the same injurious consequences to the system. As this remedy may come into use in this country, we subjoin the following formula for its preparation.

Preparation of Dr Weise's animal charcoal. Take two parts of beef or mutton deprived of fat and cut into pieces, and one part of bones well bruised. Mix and torrefy them on a gentle fire until a small flame is perceived around the apparatus, after which the heat must be continued a quarter of an hour. After they are cold, reduce to powder the carbonaceous residue, and preserve it in a well closed bottle. Dr Weise prescribes six parts of this powder with one of sugar, to be given morning and evening in doses about the bulk of a pea, (in weight two grains,) in a little water.

This preparation of carbon contains much less phosphate of lime than ordinary animal charcoal, and is therefore more easily operated on in a covered crucible.

Since the discovery of iodine and bromine in burnt sponge, physicians have been disposed to attribute to the former ingredient especially its activity as a medicine in the removal of scrofulous affections. But it appears from the experience of the German physicians, that carbon of itself may be accounted a powerful therapeutical agent.

For its convenient exhibition the French physicians suggest the following

Pastilles of Animal Charcoal.

Take—Charcoal of Weise		1oz.
White sugar in powder		8oz.
Mucilage of gum tragacanth		qs.

Make pastilles of the weight of ten grains, each of which will contain about one grain of the charcoal.—*Journal de Chemie Medicale, &c.*

Copaiva.—M. Planche presented to the Society of Pharmacy of Paris, a mixture of balsam copaiva and calcined magnesia, which manifested very little of the taste of the copaiva, and when scented with the oil of canella, lost all taste except of the latter substance. Finding that a mixture of one part of calcined magnesia with sixteen of copaiva was not solidified in a month, he made another with one part to seventeen of the balsam, but this also failing to assume a proper consistence at the end of the same time, he formed a mass of equal parts of these materials, and it was then he first remarked the loss of taste, and thought the phenomenon interesting. Several members spoke of their results in attempting to solidify copaiva, some of which were negative and others affirmative. The explanation of these contradictions is not yet satisfactory.—*Journal de Pharmacie, Feb.* 1829.

On Styrax or Storax of Bogota. By M. Bonastre.—We find in the Journal de Pharmacie for February 1830, a short account of this substance, which we offer to our readers. M. Bonastre speaks of it as having been only recently carried to Paris, and not yet in abundance. It comes from South America, and is found in the province of Santa Fé de Bogota, whence its name. It flows abundantly by incisions from a tree belonging to the genus *Styrax*, *Linnæus;* but the species is not well determined. This substance is met with in orbicular masses, a little flattened, from twelve to eighteen lines in thickness, and from five to six inches in diameter. Externally it is of a reddish colour, internally opake; the consistence is firm, very dry, though difficult to pulverize; the powder is of a reddish white. When cold it is almost destitute of odour, but when warmed, as by the hand, it diffuses an agreeable aroma sweeter than benzoin, and resembling a little that of vanilla. The odour cannot be confounded with those of the balsams of Tolu and Peru. It breaks with difficulty under the teeth, and does not impart any bitter taste.

Thrown on burning coals it exhales a pungent odour, in common with substances containing benzoic acid, but this fragrance is less agreeable than that of benzoin and styrax calamita, owing to the quantity of ligneous matter found in it.

Cold alcohol takes up all the properties of this species of styrax, and affords a solution of a deep red colour, which shows by reagents, that it contains a large quantity of acid. Its taste is pungent, slightly bitter, resembles that of the tincture of benzoin, and its odour weak. Evaporated to the consistence of an extract, and the latter dissolved in water, crystals of benzoic acid were deposited as it cooled. The residue treated with boiling water, containing some subcarbonate of soda, afforded, when filtered, a liquid of a reddish shade. Muriatic acid added to this when cold, occasioned the precipitation of numerous crystals of benzoic acid. These crystals, purified by charcoal and sublimation, were in the form of beautiful, brilliant white needles, of a very acid taste. The remainder was a solid resinous substance, of a very deep red colour.

This styrax therefore ranks with the true balsams, since it contains

1. Benzoic acid.
2. An odorous soluble resin.
3. A little bitter extractive.
4. And ligneous matter.

The Radical Metal of Magnesia.—In 1828 M. Woelher published a process for separating the metallic base of alumine by the decomposition of the chloride of aluminium with potassium. M. Bussy was led by analogy to attempt the extraction of glucinium and magnesium, the radical metals of these earths, by the same process. In this he was successful, and read a memoir on the subject to the Royal Academy of Science in January 1830.

The chloride of magnesium was prepared as follows:

Take equal parts of starch and calcined magnesia, mix them well with water, and divide the mass into small pieces, which subject to strong calcination in a crucible exposed to the open air.

This mixture is to be placed in a porcelain tube, through which a current of chlorine is passed, and the heat elevated to redness. After some time the chloride

of magnesium, which is fixed and fusible, runs along the tube and solidifies at the extremity. It is in the form of a white chrystalline mass, slightly flexible, and presenting in its fracture large brilliant scales. Water dissolves it; the taste is bitter and piquante, and it attracts moisture from the air.

Preparation of magnesium. Take a tolerably strong glass tube, about half an inch in diameter, and from eighteen to twenty inches in length, curved at one extremity. Introduce into the curved part five or six pieces of potassium of the size of a pea, and into the strait portion the chloride of magnesium, between the pieces of which are to be placed fragments of porcelain, to prevent this compound, when in a fused state, from coalescing into a mass. The strait division of the tube is now to be heated, and when brought to a dull red colour, the curved portion is to be made hot, in order to vapourize the potassium it encloses. This occasions a lively incandescence, which is diffused throughout the tube. The contents of the latter, when cold, exposes white metallic globules disseminated throughout the undecomposed chloride. When this mass is treated with water, hydrogen is disengaged, owing to some remaining potassium; at the same time flakes of magnesia separate by the decomposition of a portion of chloride of magnesium, by some potassa regenerated; and brilliant globules are precipitated to the bottom of the vessel, having the lustre and whiteness of silver. These are to be separated by decanting the liquor and washing them several times.

Properties of magnesium. This metal has the whiteness of silver, is very brilliant and malleable, flattening under the hammer, fusible at a low temperature, unalterable in dry air, but losing its metallic lustre in a moist atmosphere, by contracting a coating of white oxide. This effect, however, is confined to the surface of the magnesium. When small fragments are heated, they burn with scintillations like iron wire in oxygen gas; while larger fragments are slowly and with difficulty converted into magnesia. Pure water deprived of air has no action on this metal, but when carried to ebullition, some bubbles of hydrogen are disengaged.

Certain substances favour singularly the decomposition of water by magnesium; and the acids diluted attack the metal with a disengagement of hydrogen. It does not form an amalgam with mercury without the assistance of heat, and a very small quantity is sufficient to deprive mercury of its fluidity.

Agitated in glass vessels, this amalgam becomes covered with a metallic coating, similar to the amalgam of bismuth.

Kermes Mineral.—We find in the Philosophical Magazine for May, a short account of the composition of kermes mineral by M. Gay Lussac, taken from the Annales de Chimie et de Physic, tome xlii. p. 88. He remarks that according to the latest researches of M. Berzelius and M. Rose this compound is nothing more than a common sulphuret of antimony, deriving its colours from its minute division. Not satisfied with the proofs of this composition, he made some experiments, an account of which is contained, with their results, in this paper. He observes "I shall distinguish the precipitates formed by sulphuretted hydrogen, in a solution of antimony from kermes, properly so called, because their natures are different.

The orange red precipitate, obtained by passing sulphuretted hydrogen into a solution of emetic tartar, is an hydrated protosulphuret of antimony. In fact neither weak muriatic acid nor tartar separates any acid from it; and when solution is effected it is always accompanied with the disengagement of sulphuretted hydrogen.

Sulphuretted hydrogen produces also a red precipitate in the permuriate of anti-

mony, but it differs from that obtained from tartar emetic or the protomuriate; it is an hydrated persulphuret, which heat decomposes into sulphur, and which is a volatilized and black protosulphuret like the preceding. The black sulphuret obtained by calcining the orange red sulphuret is less fusible than the native black sulphuret; it resists the action of a spirit lamp.

It is well known that kermes varies in colour according to the mode adopted in preparing it. My observations will be made upon that obtained by the process of Cluzel (Annales de Chimie, tome lxiii, p. 122). We shall be greatly deceived if we suppose that kermes is pure only when it ceases to yield something to water, after numerous washings; for if we were to wash subacetate of copper, and many other salts, till water ceased to dissolve any portion of them, they would be completely decomposed. The fact is the same with respect to kermes; too much washing alters its nature. At what point then ought we to stop? This is readily discovered by employing the smallest possible quantity of water in the washings, and in continuing them only until the residue, supposing the water to have no chemical action upon it, contains only one thousandth or a ten thousandth of foreign matter. Kermes mineral, thus washed, has the following properties: Dilute muriatic acid, tartaric acid, and bitartrate of potash, take protoxide of antimony from it, without disengaging sulphuretted hydrogen; when dried for a long time at seventy and even two hundred and twelve degrees, it still contains water; heated by a spirit lamp it becomes black and yields water, which, as observed by M. Robiquet, is slightly ammoniacal. At a high temperature it fuses and swells up, on account of a little sulphurous gas which is disengaged.

When in layers upon glass it gives it a deep red colour, and rubbed upon paper it gives it a reddish brown colour; it is more fusible than the black sulphuret obtained by the calcination of the hydrated orange sulphuret. If a current of hydrogen be passed at a low red heat over kermes deprived of moisture by heat, much water and sulphuretted hydrogen are obtained, and the antimony is reduced; but, as observed already, the residue possesses an alkaline reaction.

After these various experiments it is unquestionable that kermes contains oxide and sulphuret of antimony, and it ought to be considered as an oxisulphuret. The quantity of water obtained by decomposing it with hydrogen is variable; but it may be considered as composed of one proportion of protoxide of antimony, and two proportions of protosulphuret. In fact I obtained 0.9 of the proportion of protoxide, and M. Henry, by another process, found the proportion still less.

It is equally certain that kermes mineral precipitated from the alkaline sulphuret which held it in solution, is an hydrate. It loses water gradually as the temperature is raised, and appears black when deprived of it; but in my experiments I did not obtain a definite proportion.

When potash, soda, or their carbonates, act upon black sulphuret of antimony, their oxygen goes to antimony, with which it forms protoxide, and the sulphur of the antimony takes the place of oxygen of the alkali. Thus it is that no kermes is obtained by boiling sulphuret of antimony with sulphuret of potassium saturated with sulphur; but by means of acid, a yellowish orange precipitate is formed in the solution, which, when heated, yields sulphur and becomes black. The golden sulphuret gives a similar result.

Vesicating Insects.—M. Farine states, that after many comparative trials on the cleopteres, he has ascertained that the *mylabris cyanescens* follows the cantharides in the vesicating properties of this tribe of insects, and that the *mylabris variabilis* is next in activity.

Those inhabiting warm places have more power than those found in opposite situations.

The blistering property is also unequal in the two sexes: thus in the *meloe majalis*, the male is always more rubefacient than the female, and all things being equal, this insect killed immediately, has more activity than if preserved alive, even if it be but for a few hours. Often also, in the insects of the same genus, one species will be vesicating and another not. Thus the *meloe autumnalis* is less rubefacient than the *majalis*, the *meloe reticulate* still less, and *tuccia*, although living in the same localities, and taking the same aliments as the *majalis*, has scarcely any activity at all. The *ripiphorus bimaculatus* et *flabellatus* are destitute of activity, whilst the *ripiphorus subdipterus* is slightly epispastic, the *zonatis præusta* is inert, and the ——— *punctata* is sensibly active.

The moment of copulation appears to be that in which some of those insects possess the greatest degree of epispastic powers. Thus M. Farine, in separating two of the *meloe majalis* when thus united, ruptured them, and caught a drop of fluid on his hand which raised a blister, while a single insect only produced a slight redness.

He therefore advises that these little animals should be collected during the season of their amours, since then they have the greatest rubefacient power, are in greater numbers, and more easily taken. Localities well exposed to the sun should be preferred, and they should be immediately deprived of life by plunging them in pyroligneous acid.—*Journal de Pharmacie, May* 1829.

Formula and processes for several Plaister Cloths, by M. Beral, Pharmacien.—In the Journal de Pharmacie for August, 1829, we find some processes different from those employed in this country, for preparing compound plaisters, to be used in the dressing of issues and as epispastics.

These plaisters are spread either on paper, linen, or silk.

No 1. *Issue Plaister:*

R.—Burgundy pitch	3 parts,
White wax	3 parts,
Yellow resin	2 parts.

Liquefy these substances in a proper vessel, and pass them through linen. Spread a thin coating on white vellum paper, strong, and sized, by means of a knife or machine. The emplastic tissue is very adhesive, and yet sufficiently consistent to prevent the leaves from sticking together.

No 2. *Blistering Plaister with Cantharides:*

R.—White wax	5 parts,
Olive oil	3 parts,
Butter of cocoa	4 parts,
Spermaceti	3 parts,
Turpentine	1 part.
	16
Cantharides	1 part,
Common water	8 parts.

Mix all these substances in a silver vessel, and boil them moderately for two hours, carefully stirring the mixture during the whole process. Then withdraw it from the fire and suffer it to stand for twenty-five minutes, immediately afterward strain through linen.

This plaister is to be spread as the preceding, on sized paper. If it is desired to have the paper covered on both sides, take that which is *unsized*, cover one side and hold it over a chafing dish of coals, when the plaister will melt and penetrate the whole tissue on both sides.

(It appears to us that the length of time (two hours) that these materials are directed to be kept *boiling*, is not only unnecessary, but must prove injurious to the compounds. Cantharides will not endure much or long continued heat, without having their vesicating powers impaired.)

A stronger preparation is directed to be made by taking

Of the above recipient	12 parts,
Cantharides in powder	1 part,
Water	8 parts.

Melting and treating them in the mode prescribed.

These plaisters may also be spread on linen or silk, by immersing these fabrics in them while liquid, and passing them through rulers with sharp edges.

Blistering Plaister without Cantharides.

R.—White wax	18 parts,
Olive oil	9 parts,
Burgundy pitch	21 parts.
	48

Extract of the bark of mezereon prepared with

Alcohol	1 part,
Rectified Alcohol	6 parts.

Dissolve the wax in the oil, then add the extract, previously dissolved in the alcohol. Apply a moderate heat, long enough to evaporate the alcohol, constantly stirring the mixture. Afterwards add the Burgundy pitch, and when it is liquefied pass the whole through flannel. Emplastic tissues of paper, linen or silk may be prepared with this compound in the mode before described, covered either on one or both sides.

A stronger epispastic plaster may be made, viz:

R.—The above recipient	8 parts,
Alcohol containing 12 scruples of extract	1 part.

Plaister for Excoriations.

R.—White wax	6 parts,
Olive oil	4 parts,
Spermaceti	3 parts,
Butter of cocoa	3 parts.

Melt these substances in a proper vessel and dip into the mixture paper, linen, or silk, and pass the impregnated tissue through wooden rulers.

Formula for a Syrup of Gum Tragacanth.—M. Emile Mouchon, fils, Pharmacien at Lyons, has offered a recipe for the preparation of a syrup of gum tragacanth in the Journal de Pharmacie for September 1829.

He directs—Gum tragacanth, pure, 3 oz. 5 gros. 24 grains.
Pure river water, 9 lbs.

The gum is to be deprived of all impurities, reduced to powder, and subjected to the action of cold water for forty-eight hours, at a temperature of 20 or 25 degrees of Centrigade thermometer: the solution to be facilitated by frequently agitating the mixture with a large wooden spatula.

He then adds simple syrup at 30°, discoloured by animal charcoal and strained, 24 lbs.

The solution being perfectly homogeneous in all its parts, the half of the syrup, nearly cold, is to be incorporated in small portions, and with the greatest care; the mixture to be passed through linen with slight expression, and the remainder of the syrup then added, constantly stirring it. The syrup loses five degrees of density by the addition of the gum, although the consistence of the mixture is greater than the syrup. These proportions give four grains of gum tragacanth for one ounce of syrup, and which, according to Bucholz, represents, if not in quantity, at least in consistence, one hundred grains of gum arabic.

At a meeting of the Society of Pharmacy on the 13th January 1830,

M. Robiquet, in his name and in that of M. Bouton, presented to the society a crystalline matter extracted from bitter almonds. This matter has a saccharine and bitter taste, and appears to be of a particular nature. M. Pelletier found analogy between this substance and oliville. This analogy is disputed by the authors.

M. Faure, Jun. of Bordeaux, addressed to the society some observations upon the solidification of turpentine by magnesia. From these observations he has drawn the following conclusions: 1. That turpentine, even with the volatile oil, may be, or can be, solidified by magnesia. 2. That it may augment the medical energy of turpentine by adding to it the essence, and afterwards solidifying the mixture. 3. That these substances are not altered by this mixture. M. Faure has given the two following formulas:

Turpentine	14 grains,
Calcined magnesia	36 grains.

Mix in a marble mortar: at the end of five or six days they form a mass which may be rolled into pills, and which do not deform.

If the mass becomes very hard, it may be softened by aid of warm water.

Vol. ol. turpentine	2 gross,
Turpentine	6 gross,
Magnesia calcinat.	36 grains.

Mix in a mortar: the mass is solidified at the end of seven or eight days; it should be preserved in a close vessel.

No. iij. vi. annee.

Journal de Chemie Medicale de Pharmacie, &c.

Feb. 1, 1830.

JOURNAL

OF

The Philadelphia College of Pharmacy.

Edited by Benjamin Ellis, M.D. Professor of Materia Medica and Pharmacy in the College, &c. assisted by a Publishing Committee consisting of Daniel B. Smith, Charles Ellis, S. P. Griffitts, Jr, and George B. Wood, M.D. Professor of Chemistry in the College, &c.

This Journal is published quarterly, in numbers consisting of 80 pages each, at $2 50 per annum, payable in advance. It is devoted exclusively to those branches of science which belong to, or compose, the pharmaceutical art, viz: Chemistry, Materia Medica, Botany, Mineralogy, Zoology, and the commercial history of drugs. In every number, except the first two, a copperplate has been inserted of some indigenous or foreign medicinal plant, accompanied with a brief dissertation respecting its history, chemical and medicinal properties, and pharmaceutical combinations. The department of selected matter consists of articles taken from the French and English Journals, and the discoveries noticed in these works relating to the art are transferred to our pages. The amount of information contained in each volume of this work is therefore very considerable. Its publication fills a hiatus in the medical literature of the United States: and it is especially deserving the notice of apothecaries, chemists, and physicians, as offering a medium through which they may communicate to those most interested in the subject, the results of their own experiments: and by means of which they

will gain early information of foreign and domestic discoveries and improvements.

The Journal will become in fact a digest of modern pharmacy, and furnish the materials for a complete history of the progress of pharmaceutical science during the period of its publication.

The following is a list of the principal articles contained in the first volume.

No. I.

E. Durand on Copaiba.
Dr Staples on Opium.
R. Philips on the Purity of Sulph. Quinia.
Cultivation of Sago in the East.
Gauthier or Linen Plaster.
Selections from Faraday's Chemical Manipulations.
J. J. Virey on Reagents.
Preface to the Codex Medicamentarius.
Wollaston's Method of Rendering Platina Malleable.
Pure Strychnia not reddened by Nitric Acid.
Artificial Production of Diamonds.

No. II.

S. Allinson on the Protoxide of Mercury and the Atomic Weight of that Metal.
W. R. Fisher on the Preparations of Iodine and their Compounds.
F. R. Smith on the Bicarbonate of Soda.
J. Scattergood on Quercia, a new Substance discovered in the Bark of Quercus Falcata.
E. Durand on the Preparation of Blue Mass.
S. Allinson on the Non-existence of Oxide of Mercury in Blue Pill and Blue Ointment.
On Plasters.
On the Upas Antiar and Upas Tieuta.
New Process for extracting the Volatile Oil of Copaiva, &c.
Selections from Faraday's Chemical Manipulations.
C. Recluz's Table of the Quantity of Volatile Oils yielded by different Plants.
Dr Hancock on the Native Oil of Laurel.
On Rhubarb.
Chinese Materia Medica.

No. III.

D. B. Smith on the Carbonate of Ammonia.
Dr Staples on Xanthoxylum Fraxinæum.

No. IV.

Subscriptions, payable in advance, received by Samuel P. Griffitts, Jun., S.W. corner of Chesnut and Eighth Streets.

The course on Materia Medica and Pharmacy will embrace a history of the articles used in medicine, their various preparations and uses, and the mode of detecting spurious or sophisticated varieties.

The College possesses a cabinet of specimens of Materia Medica, &c. which will be exhibited by the Professors to their classes, and which are well calculated to add to the interest and instruction of the students.

Tickets for both courses, at $8 each for students of Pharmacy, and $10 for others, may be had of Edward B. Garrigues, N. W. corner of Sixth and Market streets, or of the Professors.

By order of the Board of Trustees.

HENRY TROTH, *Chairman.*

A. FULLERTON, JUN., *Secretary.*

Annual Commencement.

A public commencement will be held in the Hall of the College on Monday the 25th of October, at seven o'clock, P. M., for the purpose of conferring diplomas on the graduates of the College. An address will be delivered on the occasion by Henry Troth, Esq. one of the vice presidents of the institution. Druggists, Apothecaries, and students of Pharmacy are particularly invited to attend; also physicians and others interested in the prosperity of American Pharmacy.

By order of the College.

BENJAMIN ELLIS,
Chairman of the Committee of Arrangement.

Philadelphia, Sept. 30th, 1830.